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The Convention Address

THE address which MR. A. J. FULLER delivered on Tuesday as president of the Incorporated Municipal Electrical Association covered a large variety of subjects connected with electricity supply.

Like many of his distinguished predecessors Mr. Fuller added his full quota on general subjects, but what we found of greatest interest were his remarks on some problems of modern generation, on which he speaks with the weight due to his part in the design of a power station that may eventually be the largest municipal works in Great Britain. He very properly used the occasion to reiterate that there was not the slightest chance of danger from sulphur emissions from his new Fulham station, or indeed from any power station where suitable elimination plant was installed.

We should, however, deprecate the adoption everywhere of the elaborate and expensive precautions necessary in a crowded residential area. Some hope for a cheap method of partial elimination is held out by the president in the figures he gives as a result of his investigations into the economics of pre-cleaning coal at collieries, by the quantitative separation of its impure components. The use of cleaned coal, he holds, would not only reduce the quantity of sulphur di-oxide discharged to one-fifth of the normal amount, but would also make a saving of 1s. 4d. and 1s. 8d. per ton for mechanical-stoker and pulverised fuel firing, respectively.

In his remarks upon the grid, Mr. Fuller looks ahead. While it is possible that some undertakings may be adversely affected at the moment, the real point is that the country will in the future be very much better off electrically than it would if the old lack of co-ordination had continued. With regard to bulk supplies, one must sympathise with undertakings that are required to bear local transmission charges in addition to the grid tariff, but at the same time we are surprised to learn that such additional charges are likely in themselves to have so markedly adverse an effect on load development as Mr. Fuller foresees. While agreeing to the principle of a uniform bulk supply tariff for all authorised undertakings in an area, we should have expected that, in practice, most undertakings which could be reached only by means of long transmission lines would be so far from large rivers that local generating costs (having regard to future load development) would be sufficiently in excess of the grid tariff to leave a good margin of saving after paying the extra transmission charges.

Nevertheless, even if this were so, it is most unsatisfactory that grounds for complaint should exist at

relatively inequitable treatment in the case of a national supply of electricity. The smoothing out of difficulties due to this defect in the 1926 Act will present another problem to the I.M.E.A., which will, we have no doubt, find a successful solution, thus once again proving its great value to the industry as a whole.

Consumption per capita

ELECTRICITY is the predominating form of power and a governing factor in industry and commerce, the extent of its development being an index to national progress. However, in reiterating to the I.M.E.A. his views on how distribution should be reorganised nationally, Mr. A. Nichols Moore doubts whether, as a measure of development, consumption *per capita* is a true basis of comparison. For instance, it may be that in a particular area with a small population there is intensified industrial development and, although the consumption for domestic purposes may be comparatively small, the total consumption *per capita* will be great simply because of the large use for industrial purposes. For this reason consumption *per capita* may vary widely in areas otherwise identical. Our repeated protests at the use of the classic Chicago case when the Weir Committee's report on electricity supply was issued will be recalled, for such a basis may be fallacious and misleading unless the relative figures are ascertained for the various classes of supply. It is submitted that a truer basis of comparison is the number of consumers connected in the various classes of supply and the consumption per consumer per annum. Similarly, the increase in the use of domestic apparatus per consumer would also be a more definite indication of the development of electricity for domestic purposes. In fact, it is a basis of comparison which is finding increasing favour in the States and on the Continent.

"Get on with the Job!"

THE most useful part of the report of the Federation of British Industries Mission to Canada is the definite recommendation of the delegation that the Federation shall immediately proceed to bring British trade groups together to make a study of Canadian conditions, and shall send suitable representatives to Canada to confer with manufacturers there regarding complementary production in the two countries. Nearly everything else that is advanced in the document has been urged almost to the point of weariness by the ELECTRICAL REVIEW leading articles, by our Canadian correspondents and contributors, by Trade Commissioners, and other responsible advisers, including Canadian traders visiting these offices. The need for painstakingly searching out the character of the market; for utilising the service of Trade Commissioners; for recognising the geographical and financial advantage of the United States, and endeavouring to counteract it; for securing ampler and freer communication facilities; and for doing everything in reason to simplify the procedure for the Canadian importer—all this and much more is so well known as hardly to justify repetition. Writers and others have been laughed at, or ignored, when they have suggested that our manufacturers and their organisations should spend money in establishing trading operations in Canada. Several co-operative electrical and engineering schemes have been tried both there and in other overseas markets, and it has to be confessed that they have failed. Be these things as they may, here we have the recommendation seriously and strongly advanced once again by one of our greatest industrial associations that home producers should act co-operatively. We have had many assurances that British electrical manufacturers could do a bigger trade in Canada if they would. Through its affiliation with the F.B.I. cannot the B.E.A.M.A. give a lead? The South American effort was magnificent; can we get to work now in Canada ignoring the chilling influence of the American underwriters' wet blanket? Surely in such a matter co-operation is practicable without suppressing individual initiative and enterprise.

Home Again!

SEVERAL years ago British engineering workers were attracted to the States by a trade boom and high wages. The loss of some of the most highly skilled craftsmen of the industry was deplored here, and fears were expressed that when our own engineering industry revived we should be placed at a disadvantage by a shortage of the best type of men. But things have not worked out quite according to plan. The continued depressed state of industry here, as reflected in the recent negotiations between the engineering employers and the unions regarding wages and conditions, gives little promise of employment for recently-returned men, who, having profited from America's prosperity, are now driven home by her adversity. The transatlantic slump has inflicted upon these British workers six months' idleness in which to exhaust their savings, and according to Press reports they are returning encouraged by the con-"dole"-ing atmosphere of the Motherland. Their presence on the labour market will hardly be welcomed by the A.E.U. at the present critical juncture.

A Foreign Trade Comparison

THE official returns of foreign electrical trade published by the Governments of the three leading exporting countries for the first quarter of the current year disclose a peculiar situation. Great Britain, Germany and the United States all report decreased exports for the period. In the case of the United States the decline was very considerable—nearly 40 per cent. as compared with the first quarter of 1930. Great Britain's electrical exports were also considerably smaller in value, the fall being nearly 30 per cent. Germany's, however, were reduced by only 14 per cent. With regard to imports of electrical machinery and apparatus, Great Britain remained the largest market of the three countries but reduced her purchases by 37 per cent. in comparison with the March quarter of last year. Electrical imports into Germany were 29 per cent. lower, but the United States took 33 per cent. more. Great Britain is the most important European customer of the United States for this class of goods, but this year our purchases have been smaller. This, no doubt, accounts in an appreciable measure for the large declines in our electrical imports and the United States electrical exports.

The Contractors' Conference

AT Eastbourne next week the members of the Electrical Contractors' Association meet in annual conference for the sixth successive year. The conference follows very closely upon that of the I.M.E.A., which is unfortunate and may adversely affect the attendance. The later date of the I.M.E.A. Convention was principally due to the incidence of Whitsun this year. One of these days we may have a "convention co-ordinating" body to arrange these matters more satisfactorily. A possibly unique feature of this year's contractors' conference is the fact that both of the papers which are being read are by officials: Ald. R. Tweedy-Smith is solicitor to the E.C.A., while Mr. L. C. Penwill is the general secretary. The authors' official experience has enabled them to produce papers on subjects of immediate and practical interest. For the rest, the arrangements are in the hands of a capable organising committee and the conference should be as pleasant and successful as its predecessors.

Engineering and Financial Statistics

THE Electricity Commissioners' return for the year 1929-30 has just been published—about 13 months after the end of the period to which it relates. Though marked improvement has been shown in recent years, the value of the statistics is still depreciated by the time lag, and if this is due to laggards among the supply undertakings in making their returns, we trust they will mend their ways, as this is a case in which the speediest is most emphatically tied to the slowest.

The Scarborough Convention.

Specially reported by representatives of the "Electrical Review"

SCARBOROUGH, *Monday Night.*

MANY well-known figures in the electrical world arrived in Scarborough during the week-end. Most of them travelled by road, among them being the President and Mrs. A. J. Fuller, whose enjoyment of a quick journey in fine weather was, unfortunately, marred by a mishap, due to an encounter with a charabanc at a hump-back bridge near their destination. In avoiding a serious collision, Mr. Fuller told me, he was driven into the wall, and burst a tyre.

Remarkable road speeds formed the subject of numerous claims and counter-claims on Saturday and Sunday, until as a subject of emulation it was exceeded by the size of hailstones observed on Sunday afternoon. If Mr. and Mrs. Leadbeater held the record in the former case, the hon. secretary, Mr. W. C. P. Tapper, (whose first Convention it is officially, and who, with Mrs. Tapper, came up by train on Saturday) must be regarded as the winner in the matter of hailstones. Possibly there will be other similar competitions before Mr. R. N. Torpy returns the golf scores on Thursday. The heat experienced in London last Saturday lasted as far as York, but the temperature fell to a marked degree as the coast was neared, and at Scarborough there was a distinct "nip" in the air. For the last 30 miles or so the railway serpentines and enjoyment of the fresh air was prevented by the rapidity with which the smuts blowing from the engine changed from one side to the other. This will be one discomfort, at any rate, that we shall get rid of when we have electrified our main lines.

The York-Scarborough line, incidentally, passes the picturesque old town of Malton, which has had a statutory supply for about 25 years and is now an isolated outpost of the far-flung Newcastle-upon-Tyne group of companies. From the train the graceful pylons transmitting power to Bridlington appear to add to the amenity of their lovely background.

The first person I met at the Grand Hotel was Mr. J. W. Simpson, the always-helpful secretary, putting the last touches to the Convention arrangements. The number of delegates and visitors exceeds all previous occasions (even last year, although Eastbourne was so convenient of access from London) and Mr. Simpson believes that the success will be equally in advance, with one proviso—Mr. Simpson is not Clerk of the Weather. In this respect conditions seem promising—in spite of the now notorious storm of Sunday afternoon.

Mr. E. J. Jarvis (borough electrical engineer, Scarborough) also looked in to discuss local arrangements with the secretary, and evidently regards it as "up to" his town to provide the "best ever."

The early arrivals also included Capt. J. M. Donaldson (president-nominate I.E.E.), Mr. and Mrs. H. C. Lamb (Manchester), and Mr. and Mrs. P. J. Robinson (Liverpool), in addition to those anxious to see their precious goods delivered safely at Olympia. This morning the Convention offices officially opened at 10 a.m., and the well-known game of badge reading started.

In spite of its large membership (which cannot bring much less than £20,000 into the town) the Convention has become imbued very much with the club spirit. There are so many one knows in both their business and brighter moments, and also so many others one knows well enough to talk to without always quite recollecting their names or where they come from.

After a walk along the Marine Drive this morning some of us accompanied the President for a ride on the miniature railway from Peasholm to the sea and back—quite an amusing

(1) Mr. and Mrs. J. K. Brydges (2) The President takes Charge (3) Bailie David Orr and Mr. W. C. Bexon (4) The Hon. Secretary (Mr. W. C. P. Tapper) (5) Some early arrivals: Mr. D. R. Myers; Mrs. W. A. Walker; Mrs. Fuller; Mrs. A. J. Hedgcock; Mr. Fuller; and Mrs. Myers (6) Mr. E. J. Jarvis (Scarboro' Electrical Engineer)

experience. The locomotive (oil-driven and disguised as a modern steam loco.) is a real toy for adults, and Mr. Fuller showed that his engineering interests are not confined to super-stations.

The town presents a gay spectacle at night with the flood-lighting of the old castle and the cliff gardens, and the festoon of lights strung along the tramway trolley poles. Outside the Grand the B.T.-H. Co. is exhibiting "Beauty enriched by Light"—the company's well-known dancing girl.

The very large and representative company assembled in Scarborough includes the following:—

A. J. Abraham (Bexley Heath); W. E. Affleck (Guildford); D. W. Allison (Standard Telephones & Cables, Ltd.); H. W. Angus (Eccles); H. E. Annett (Bolton); N. Appelbee (Ashton-under-Lyne); Ll. B. Atkinson (Cable-Makers' Association); R. Ayton (Winchester).

W. J. Bache (Cheltenham); A. W. Barham (Watford); Major E. A. Barker (Barnsley); E. G. Batt (G.E. Co., Ltd.); W. E. W. Beerling (Carron Company); J. Alex. Bell (Aberdeen); Major Herbert Bell (Glasgow); C. R. Belling (Belling & Co.); G. J.

Assembling at the Spa Ballroom

Berry (Berry's Electric (1928), Ltd.); S. F. Bickell (Revo Elec. Co., Ltd.); W. C. Bexon (Ayrshire Elecy. Board); A. Bishop (Buxton); D. H. Bishop (Dundee); H. E. Blackiston (West Hartlepool); A. S. Blackman (Sunderland); A. W. Blake (Willesden); A. V. Bland (Chamberlain & Hookham); T. Bloore (Sutton Coldfield); F. A. Bond (Battersea); J. H. Bowden (Poplar); W. D. Brassington (Motherwell); S. E. Britton (Chester); Sir J. R. Brooke (Electricity Commission); J. K. Brydges (Eastbourne); C. W. Buckley (Santon, Ltd.); H. R. Burnett (Barrow-in-Furness); J. W. Burr (Swansea).

A. Q. Carnegie (C. A. Parsons & Co., Ltd.); R. A. Chattock (London); J. Christie (Hurlingham); A. W. Clegg (Accrington); P. Clegg (Bingley); S. Clegg (Lincoln); T. M. Climie (Falkirk); W. N. C. Clinch (Brighton); W. H. Cooke (Luton); W. J. Cooper (Hamilton); F. H. Corson (Gloucester); H. T. Cort (Brush Elecl. Eng. Co., Ltd.); H. W. Couzens (Bethnal Green); R. Cox (Yorkshire Switchgear & Eng. Co., Ltd.); A. C. Cramb (E.D.A.); E. Cross (Rotherham).

V. W. Dale (E.D.A.); C. S. Davidson (Barnes); D. H. Davies (Chesterfield); H. C. Day (Heywood); H. H. Denton (Crewe); A. J. C. DeRenzi (Newcastle-under-Lyme); W. A. Dexter (Mirrlees Watson Co., Ltd.); Isaac Dixon, F.S.I. (Liverpool); J. G. Doran (Bermondsey); Capt. J. M. Donaldson (North Met. E.P.S. Co.); Sir Andrew Duncan (Central Elecy. Board); D. N. Dunlop (B.E.A.M.A.); Councillor A. H. Dykes (Beckenham).

J. Edgar (South Shields); E. A. Edwards (Credenda Conduits Co., Ltd.); J. E. Edgcumbe (Kingston-on-Thames); F. F. Elliott (Woolwich); W. H. Elliott (East Ham); E. Ellwood (Manor Elec. Oven & Fire Co.).

Capt. G. Falk (Falk, Stadelmann & Co., Ltd.); J. E. Favell (Revo Elec. Co., Ltd.); S. E. Fedden (Central Elecy. Board); J. B. Feltham (Mexborough); Mrs. S. Z. de Ferranti (Chairman E.A.W.); V. Z. de Ferranti (Ferranti, Ltd.); W. K. Fleming (Rothesay); F. M. Fletcher (Darwen); J. Y. Fletcher (G.E. Co., Ltd.); F. Forest (Birmingham); S. H. Fowles (Loughborough); O. F. Francis (Kirkcaldy); H. G. Fraser (Wakefield); W. Frisby (Colchester); C. A. Frost (Bexhill); A. J. Fuller (Fulham); C. Furness (Blackpool).

S. C. Gibson (Nuneaton); A. T. Gillanders (Standard Telephones & Cables, Ltd.); G. E. Green (George Green & Co.); C. E. D. Greenhalgh (Ilkley); C. Gregory (Evershed & Vignoles); R. W. Grubb (Dewsbury).

H. Haigh (Gainsborough); H. Hall (Gillingham); T. Hall (Burton-on-Trent); B. Handley (Portsmouth); R. C. Harpur (Dover); A. F. Harris (Nalder Bros. & Thompson, Ltd.); Miss C. Haslett (E.A.W.); H. G. W. Haslett (Chesterton, Jones & Co., Ltd.); A. M. Hawkins (L. G. Hawkins & Co., Ltd.); B. T. Hawkins (Wallasey); R. M. Hawkins (Belling & Co.); H. C. Hazel (Pres. E.C.A.); A. J. Hedgcock (W. T. Henley's Telegraph Works Co., Ltd.); C. N. Hefford (Leeds); T. W. Hibbert (Doncaster); G. J. Hollyer (Torquay); E. E. Hoadley (Maidstone); R. Hopkinson (Hopkinsons, Ltd.); J. Hopton (Normanton); A. J. Howard (Taunton); F. H. Howell (Domestic Electrification, Ltd.); J. Snow Huddleston (Union Cable Co., Ltd.); Ald. E. Huntsman (Nottingham); J. B. Hudson (Leigh); A. E. Iliffe (Benjamin Electric, Ltd.).

C. W. Jackson (King's Lynn); W. A. Jackson (West Bromwich); E. W. James (Heston & Isleworth); E. J. Jennings (Birmingham); A. C. Johnson (Southend-on-Sea); C. M. Johnston (Shrewsbury); W. S. Johnston (St. Helens); B. Jones (Bedwellty); S. D. Jones (Batley); W. J. Jones (E.L.M.A.).

B. Kelly (Douglas, I.O.M.); D. C. Kennett (Hackbridge Elec. Cons. Co., Ltd.); T. A. Kerr (Stretford); T. A. Kingham (Kingston-on-Thames); D. M. Kinghorn (Southwark); J. D. Knight (Ealing); A. E. Knights (Bury St. Edmunds).

G. H. Lake (Nottingham); H. C. Lamb (Manchester); J. Lambert (Perth); A. L. Large (Bulpitt & Sons, Ltd.); H. Large (Stoke Newington); J. Leadbeater (Hampstead); Major T. G. Leith (G.E. Co., Ltd.); R. Lee (Stockport); F. E. Lewis (Canterbury); W. P. Lilwall (Fleetwood); H. A. Lingard (B.T.-H. Co., Ltd.); A. C. Livesey (Brookhirst Switchgear, Ltd.); F. M. Long (Norwich); F. Lonsdale (Fraser & Chalmers Eng. Works); J. H. Lumsden (Stalybridge); J. R. P. Lunn (Darlington).

A. P. MacAlister (Islington); W. D. Madden (Hick, Hargreaves & Co., Ltd.); T. A. G. Margary (Wolverhampton); S. G. Marston (Stockton-on-Tees); W. J. Marston (Coventry); T. R. Martin (Birmingham); M. S. Mason (Worksop); F. V. L. Mathias (Warrington); W. R. May (Lowestoft); D. McDougal (Greenock); C. F. McInnes (Gravesend); A. E. McKenzie (Wimbledon); N. McLean (Harrogate); E. A. Mills (Halifax); G. C. Milnes (Lancaster); Lady Moir (E.A.W.); A. Nichols Moore (Newport), (Hon. Treasurer); E. Morgan (Sheffield); R. J. Morris (Edison Swan Elec. Co., Ltd.); C. J. Mortimer (Morecambe); J. Mould (Leicester); E. Moxon (Southport); E. K. Muir (J. H. Tucker & Co., Ltd.).

H. A. Nevill (Peterborough); C. G. Morley New (Cardiff); F. Newey (Long Eaton); P. E. Newnam (C. A. Parsons & Co., Ltd.); F. Nicholls (Derby); E. J. Nichols (York); A. Nicklin (Swindon); G. Nicolson (Weymouth); G. H. Nisbett (British Insulated Cables, Ltd.). F. L. Ogden (Oldham); E. G. Okell (Plymouth).

Sir A. Page (Central Elecy. Board); J. H. Parker (L.C.C. Tramways); W. A. Parker (Workington); C. C. Paterson (Pres. I.E.E.); L. C. Penwill (Elecl. Contractors' Assoc.); R. W. L. Phillips (Bedford); H. C. Pierson (Metropolitan-Vickers Electrical Co., Ltd.); W. F. T. Pinkney (Newcastle-upon-Tyne Elec. Supply Co.); G. Porter (Worthing); G. G. L. Preece (Bruce, Peebles & Co., Ltd.); F. W. Purse (London & H.C. J.E.A.).

P. N. Rand (English Elec. Co., Ltd.); W. E. Rawlinson (Hotpoint Elec. Appl. Co., Ltd.); W. Redman (Shipley); F. N. Rendell-Baker (Croydon); C. Garfield Richards (Port Talbot); J. H. Rider (London); J. G. Robertson (Babcock & Wilcox, Ltd.); W. H. Robins (Stafford); I. V. Robinson (B.E.A.M.A.); P. J. Robinson (Liverpool); G. Robson (Richardsons, Westgarth and Co., Ltd.); T. Roles (Bradford); L. Romero (Salford); A. E. Roots (Dumfries); J. H. Rothwell (hon. solicitor) (Brighton); Wm. A. Royle (Blackburn); F. H. Rudd (Rochdale); A. J. Ryan (Hastings); P. E. Rycroft (Great Yarmouth).

C. W. Salt (Carlisle); D. H. S. Sanderson (G. Bray & Co., Ltd.); R. H. Schofield (Ferranti, Ltd.); R. H. Scotson (Middlesbrough); E. Seddon (Edinburgh); W. M. Selvey (London); E. E. Sharp (Venner Time Switches, Ltd.); A. H. Shaw (Ilford); C. M. Shaw (Worcester); T. S. Shenton (Rugby); J. E. Shepherd (Rawtenstall); J. H. Shepherd (Harwich); H. F. Sherbourne (Yorkshire Copper Wks., Ltd.); J. S. Simmonds (W. T. Henley's Teleg. Wks. Co., Ltd.); C. H. Smith (Electric Fires, Ltd.); R. Smith (B.E.T.); Alderman R. Tweedy Smith (Southend-on-Sea); R. W. Smith (Drake & Gorham Wholesale, Ltd.); W. B. Smith (Paisley); W. J. Smither (Dorchester); C. H. Smyth (St. Marylebone); J. W. Spark (Bath); F. E. Spencer (Birkenhead); G. R. Spurr (Walthamstow); N. Staniland (Hornsey); J. E. Starkie (Burnley); C. W. Sully (E.L.M.A.); G. Summers (Stirling Boiler Co., Ltd.); F. Swarbrick (Basingstoke); J. J. Swarsbrick (Ferguson, Pailin, Ltd.); P. H. Symonds (English Elec. Co., Ltd.); E. C. Symondson (Young, Osmond & Young, Ltd.).

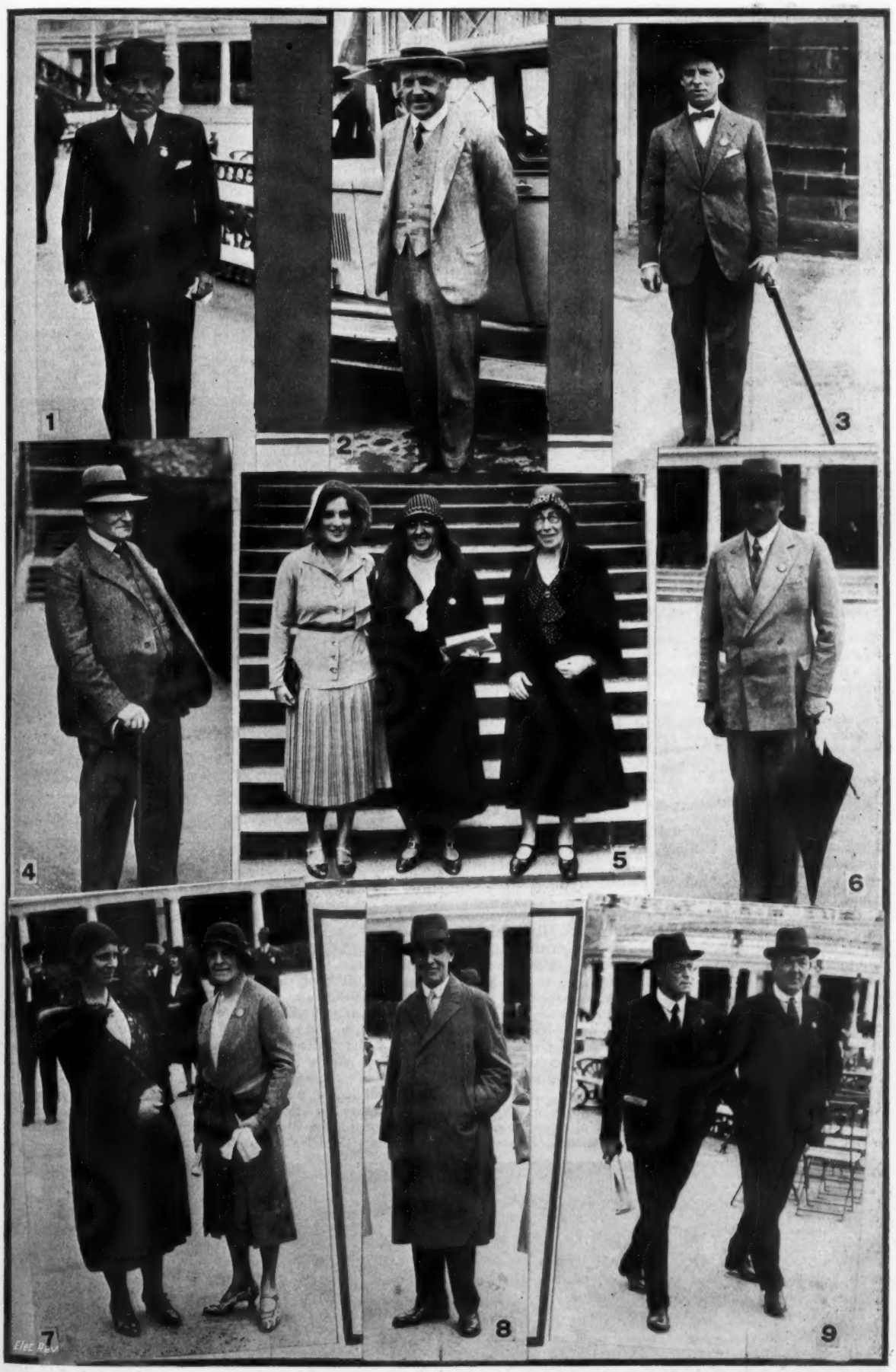
J. E. Tapper (Beckenham); W. C. P. Tapper (hon. secretary) (Stepney); H. Taylor (Mather & Platt, Ltd.); W. H. Taylor (Johnson & Phillips, Ltd.); D. Thomas (Abertillery); J. R. Thomas (Edison Swan Elec. Co., Ltd.); J. H. Thompson (Colne); W. H. Thompson (Underfeed Stoker Co., Ltd.); G. W. Thompson

Members Signing On

(W. T. Glover & Co., Ltd.); R. N. Torpy (Tunbridge Wells); W. G. Trend (Bromley); C. Turnbull (Tynemouth); W. A. Turnbull (Aylesbury); H. C. Turner (Salford Electrical Instruments, Ltd.); W. C. Turner (Southampton); W. H. Turner (Yorkshire Switchgear & Eng. Co., Ltd.). Col. W. A. Vignoles (Evershed & Vignoles, Ltd.).

J. N. Waite (Hull); Ald. W. Walker (Manchester); E. A. Ward (Siemens Elec. Lamps & Supplies, Ltd.); P. Wardle (Cannock); A. J. Waring (Felixstowe); V. Watlington (English Elec. Co., Ltd.); Lt.-Col. H. W. Watts (Epsom); H. Webber (Keighley); W. Weekes (Shoreditch); J. Wetherell (Leyton); P. P. Wheelwright (Edison Swan Elec. Co., Ltd.); Councillor G. H. White (E.W.F.); F. H. Whysall (Belfast); F. H. Williams (Jackson Electric Stove Co., Ltd.); J. W. Williams (Wrexham); R. Willis (Cheadle); T. Wilkie (Association of Public Lighting Engineers); H. Wilkinson (Radcliffe); D. Wilson (International Combustion, Ltd.); J. L. Wilson (B.T.-H. Co., Ltd.); T. P. Wilmshurst (Elecy. Commission); S. R. Windle (Grimsby); W. B. Woodhouse (Yorkshire Elec. Power Co.); W. H. Wraith (Standard Telephones & Cables, Ltd.).

C. H. Yeaman (Stoke-on-Trent); F. A. Yerbury (Premier Cooler & Engineering Co., Ltd.).



(1) Mr. A. Nichols Moore (Hon. Treasurer) (2) Sir John R. Brooke (Electricity Commission) (3) Mr. V. W. Dale (E.D.A.) (4) Mr. R. A. Chattock (5) Miss Y. de Ferranti, Mrs. S. Z. de Ferranti, and Mrs. J. Christie (6) Mr. A. C. Cramb (E.D.A.) (7) Miss C. Haslett (E.A.W.) and Mrs. A. Nichols Moore (8) Lt.-Col. W. A. Vignoles (9) Ald. W. Walker and Mr. P. J. Robinson (Liverpool)

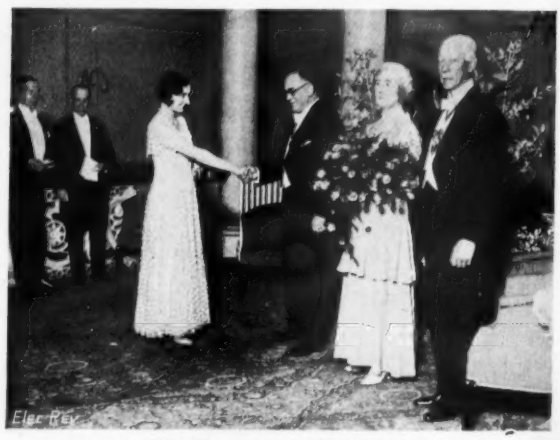
The Entrance to Headquarters

TUESDAY.

Delegates and visitors continued to arrive until a late hour last night. Although again a large proportion came by road, the 1.15 p.m. from King's Cross might almost have been regarded as the "Association Special," as it brought many of the foremost members of the electrical industry. By 8.30 p.m. most of the arrivals were trooping up the staircase from the lounge of the Grand Hotel to be received by Mr. and Mrs. Fuller, who were supported by the Mayor of Fulham (Alderman W. J. Waldron, J.P.). The more nimble of the visitors then commenced dancing, but for the others desiring sedentary occupation a musical programme had been arranged. The festivities officially terminated at 1 a.m., and by that time, as usually happens, most of the younger members, wearied by travelling, had retired to bed, while the more mature in years settled down for the evening, as Mr. Chattock put it.

This morning saw the official opening of the Convention in the Spa Ballroom, where the large hall was filled by members. A civic welcome was accorded by the Mayor of Scarborough, supported by leading citizens. His Worship was quite frank about the material advantages of the Convention to the town, but he left no doubt as to the cordial nature of the town's welcome. Indeed, it is wonderful what an open sesame the little Convention badge is to the amenities of the "Queen of Watering Places." The Corporation, like its electrical engineer, is quite evidently all out to give members the happiest recollections of Scarborough. The Mayor said that the chairman of the Electricity Committee (Alderman Whitfield) knew all about electricity, but in practical matters was guided by the engineer. He exhorted his hearers, somewhat unnecessarily, not to take the work of the Convention too seriously, giving awful examples of the zeal of other associations. This, the largest and most imposing of all electrical conventions, is, in my opinion, thoroughly well balanced between the social side and technical and other aspects. Moreover, it does really educate all concerned, particularly committee men; municipal electricity supply is undoubtedly a success in Great Britain, but I doubt whether this would have been the case to anything like the same degree, but for the influence of the Association in a long series of conventions. The old heresy of relieving rates from profits would have taken considerably longer to die. The number attending the Conventions increases every year; the Mayor recalled that at the last Scarborough meeting, eight years ago, delegates and visitors totalled 300; this year the number is well over 1,100.

As will be observed from our list, leaders of all sections of the industry are present. The reason for this interest, I think, is that it is becoming more and more evident to all that electrical progress depends largely upon the ability and the will of the electricity supply section to increase consumption and promote the uses of electricity. Committee men attending these Conventions come to appreciate how essential it is to maintain the status of the supply engineers, which implies the acceptance of an adequate salary scale. They will also learn in time, no doubt, that running power stations is not the principal part of an engineer's duties, and that the closing down of some stations under the Grid schemes does not in any way justify less remuneration.



The President's Reception
(Miss Dalrymple; Mr. Fuller; Mrs. Fuller; and the Mayor of Fulham)

After the civic reception, Mr. Fuller read his presidential address, which is dealt with on page 1027. He concluded with the usual call for the support of allied associations, such as the E.A.W., E.D.A., and the E.R.A., which should not, on account of its being an oft-told tale, lose any of its force. As a sidelight on the work of the president, Mr. Fuller told us that during the past eleven months he had attended 134 committee meetings, in addition to his work in connection with his new station. I said yesterday that Mr. Simpson was not Clerk of the Weather; it appears that that falls within the duties of the President, or, perhaps I should say, of this year's President, since Mr. Fuller gave us to understand that he had some occult control over depressions around Iceland and Ireland. He has done very fairly so far, but gathering clouds this afternoon indicate that this part of his duties will possibly be the most onerous.

Several ladies remained to hear Mr. Hoadley's paper on "Electricity in Home Service," in spite of a counter-attraction in the shape of a reception by Mrs. Fuller at Children's Corner Café in the Spa.

Delegates and Visitors to the Incorporated Municipal

The Cost of Electric Home Service

Electrical home service was the first subject dealt with, and Mr. Hoadley's paper (see page 1028) was read in abstract form by the author. It indicates that it costs the supply authorities little more to get £30 domestic revenue per house yearly than to get £4 per year. His contentions were generally upheld in the discussion.

MR. J. K. BRYDGES, of Eastbourne, confirmed the necessity for putting themselves in a position to take domestic loads, especially where no industry existed. The first necessity was a suitable tariff. His had been criticised as too low at first, but 30 per cent. increase in units used during the first year had justified it. They must teach the rising generation, and his committee installed demonstration cookers in schools on favourable terms. Others should follow suit, as it was often a question of cooker or cook. He thoroughly supported standards and recommended the E.D.A. report on domestic water heating and its pamphlet on design and construction. He would like to know how to continue his successful low rates when purchasing from the Grid in bulk.

The MAYOR OF AYLESBURY (Councillor STANDRING) considered the very small householders valuable; they could be converted by demonstrating that at one penny per unit dinner could be cooked for three persons for three-halfpence. The type of cooker needed was one to keep the cost of cooking low.

MR. A. E. MCKENZIE, Wimbledon, said he had arranged for children to visit his works during school hours. They would not go in their own time. Selling energy cheaply was the thing. Irons should be issued broadcast on free trial; few would come back. Entire house heating could not be done at Grid prices, and he had been unable to make out a case for school heating in Wimbledon. More could be done with correct utensils than with tariffs on new estates. It was important that water tanks should be suitable for inserting immersion heaters.

ALDERMAN W. HEBDEN, Shoreditch, disagreed with the middle-class theory. Artisans had to spend five shillings on coal and three shillings on gas weekly, as they did not have

Listening to the Presidential Address

their meals away from home. Wherever there was a gas cooker there could be an electrical one. The greatest fear was that something might go wrong, and they must convince people that nothing did go wrong, and that electric cooking was an economical proposition. It was only nibbling at the subject if middle-class homes alone were satisfied; it was not a question of whether artisans could afford electricity, for they must cook at home each day, thus guaranteeing sure revenue.

The President and Mrs. Fuller pose for the "Electrical Review"

MRS. H. C. LAMB said that the paper was most interesting to women, but it showed that the author did not brush and dust his home. Women did not want electric homes because they made revenue, but because they were cleaner and healthier to live in, and vacuum cleaners would help materially.

The PRESIDENT expressed appreciation of the women's point of view, which was always valuable. Mrs. Lamb's delightful speech was much appreciated.

MR. A. W. BARHAM, Watford, considered that two-part tariffs were correct, but the rates must be fixed at the lowest level. Hire-purchase must not be at less than the cost of the device in the hope of making up the difference on the sale of energy. Watford's halfpenny rate had recently been reduced, but he was doubtful about Grid prices. Seventeen years' domestic load encouragement had increased that load very considerably. While he agreed with the paper, he thought that its author would probably return home and reduce his tariffs to something that the community could afford.

At the close of the discussion, MR. HOADLEY said that he proposed following Mr. Barham's recommendation to reduce the secondary charge of his two-part tariff.

The Official Photograph

The official photograph was taken on the sands, and after lunch the official visit to the exhibition at Olympia took place. Impressions of the exhibition are given on page 1025.

While waiting for the others, I walked along St. Nicholas Street and found a shop decked out by Ferranti, Ltd., with a range of fires, a radiogram, and, of special interest to supply engineers, a completely-equipped Grid metering panel. There were also a 20,000-V surge-absorber testing apparatus and a new moving-coil voltage regulator. I also visited the attractive and well-arranged Corporation showroom in Westborough, a view of which appears on page 1065.

Electrical Association Convention, Scarborough, 1931 *[Photograph by H. Walker, Scarborough*

WEDNESDAY.

The Spa ballroom last night was in striking contrast to the morning. The dance was a great success, and there were several new arrivals, including Mr. and Mrs. Vincent Ferranti, who excused their late arrival by the fact that they had arrived in England only last Friday from six weeks' tour in Canada and the U.S.A. Mr. Ferranti says the trade depression is very bad in both countries, and he is glad to be back in relatively good conditions in England. The only electrical business in the U.S.A. was in connection with refrigerators and clocks, and there are no new developments with large three-phase transformers of, say, 60,000-kVA such as there are in this country. Regarding clocks, Landis & Gyr, Ltd., are displaying several electrically-wound models at the Grand Hotel, and also have opened a demonstration room at Westborough. A notable absentee from the Convention is Mr. L. L. Robinson, borough electrical engineer, Hackney, but he is expected to arrive on Thursday with Mr. and Mrs. Townley, all of whom have been delayed by an inter-municipal dispute. Mr. A. C. Cramb, director, E.D.A., is evidently enjoying his first freedom from the cares of the Convention for many years, and he can now presumably appreciate how much all delegates owe him for his past labours on their behalf. There was a much-appreciated cabaret and excellent buffet arrangements, and a band was in attendance during the whole function, which went off with a swing, showing that all had acquired the Convention spirit. The function terminated at 1 a.m., but I learn this morning that some of the brighter young-in-spirit members regarded Tuesday as all too short and borrowed several hours from to-day. The evening afforded many opportunities for technical discussions and exchanges of views which may not provide so much immediate fruit as the official papers, but are surely the seed for many ideas which will germinate.

The ballroom was retransformed this morning for the paper by Mr. Dixon on rating. The address indicated the author's grip of the subject. He reduced principles to a common practical basis which obviously appealed to his audience. It is possible that his very lucidity made rating appear simpler than it could be. He stressed the immorality of trying to dodge one's fair share of the national rating burden, and quashed Mr. Waite's ingenious suggestion, excellent as far as it went, of avoiding profits for rating by reducing tariffs

A Trip to the Moors

The weather for the afternoon jaunt to Whitby looked none too favourable, and members were beginning to think that the President's ability to control the weather was less conspicuous than the way he managed other things. Fortunately it cleared up in time to enable us to enjoy a wonderful trip over the moors, stopping at Saltersgate to see the fire that is never quenched at the "Wagon and Horses" Inn there. The moors, as those who have tramped over them in all weathers know, have an atmosphere not found in more thickly-populated parts. They form part of the recently-extended area of the North-East Group of power companies. Mr. W. F. T. Pinkney seems as proud of their natural beauties as of the organisation necessary for their development on a commercial basis. We saw them in the sunshine and also in one of those swift bracing showers that add so much true pleasure to real trampers. Whitby is one of the delights of our coasts, with St. Hilda's Abbey ruins a landmark for miles around. Other villages and townships, such as Pickering and Thornton-le-Dale, are real localised types with structures quite distinct from the half-timbered buildings to be found in the Southern counties. Tea was taken at the Metropole Hotel, and the party returned to Scarborough in time for an unofficial dance at the Grand Hotel.

Rating Assessment of Undertakings

The first thing this morning Mr. Isaac Dixon read his paper (abstracted on page 1029) in outline. The President described the paper as one of the best that the Association had had on the subject.

Councillor H. C. COATES, Watford, commended the paper's lucidity. That the industry was protected against unfair competition was a half-truth, and the statement that it was not over-assessed would be contested generally. Comparing gas and electricity, did the author imply that electricity should be more highly rated because its expansion was more rapid?

MR. J. N. WAITE, Hull, thought the paper a clear presentation of the law as it stood. They should be grateful that they could only be assessed as a whole, the resulting cat fight over apportionment not being their affair. They were merely purveyors of energy, and there were other means of providing energy, so the industry was not monopolistic. In apportionment not only gross receipts but respective expenditure also must be considered. They might reduce profit by lowering prices and form an equalising fund so that over a period there would be no profit and therefore no rates.

Alderman W. WALKER, Manchester, pointed out that owners of undertakings were called upon to bear their fair share of the burden and not thrust it upon others. They wanted fairness and uniformity without any common principle of assessment. The author's remarks on the grid were important, and that aspect would be taken into account in fixing grid prices in Scotland. If rating authorities were impartial they should arrive at a common basis for rating.

MR. T. ROLES, Bradford, remarked that the existing diversity showed either that valuers did not know their jobs or that several cases could be made out for any one instance. Uniformity could be obtained by levelling up rather than down. Something might be done if there were definite agreement about the life of assets; for instance, a boiler house which was now part of the boilers themselves.

Councillor C. A. CRITCHLEY, Blackburn, suggested that complete exemption or derating would have been a fine gesture, since the national object was cheap and abundant electricity.

Alderman H. B. VORLEY, Islington, said the paper had taught him more than he had been able to learn from anybody. Lack of uniformity made chaotic conditions, and methods varied according to local valuers' opinions, so that it was difficult to use any one year as a basis. The hypothetical landlord and tenant were the same, being the consumer who always had to pay. Those whose capital was inflated were coming off badly. Why not take an average of ten years, five back and five forward? Relief passed on to power consumers would stimulate industry.

MR. C. GARFIELD RICHARDS, Port Talbot, said the paper had not helped to solve the problem. The monopoly theory was fallacious; his undertaking had been seriously threatened with private competition, and they had no power to stop it. Rating was a direct tax on efficiency and handicapped concerns which must compete with private plant.

Councillor J. FLANDERS, Felixstowe, asked whether the author could justify both the derating of productive industries and the imposition of rates on the supply industry.

The AUTHOR, in reply, pointed out that Parliament made laws which must be enforced. They would not be any better off by trying to do something unlawful. Those who were not satisfied should change the law, not by commencing at the top but at the foundations. From the rating point of view, there was a large element of monopoly. No profits did not necessarily mean no rates. To get uniformity of valuation there must be valuation first, which needed time to achieve. There was reasonable ground for revising the law so far as public utilities as a whole were concerned.

General Views of the Electrical Display at Olympia, Scarborough

The I.M.E.A. Exhibition: Some Impressions

The display at the Conference by most of the leading manufacturers in this country clearly indicates the trend of development in domestic-apparatus production and use

SCARBOROUGH, *Tuesday.*

NO doubt the value of the I.M.E.A. exhibition lies more in the personal contact between the supply engineer and manufacturer in the correct atmosphere than in the actual inspection of apparatus, at any rate, as far as domestic equipment is concerned, and such apparatus certainly predominates again this year.

My Main Impressions

Increasing desire of the supply man to represent the consumer and readiness to sink his personal predilections on questions of design; keenness of the manufacturer to make the main issue that of securing domestic load; marked tendency towards standardisation in connection with domestic apparatus, particularly cookers, without losing the makers' individuality on special points of design on which much in money, time, &c., has been spent on research; strong desire that competition in a broadminded sense shall continue; general movement towards reduced overall dimensions of cookers without materially reducing the cooking space, and towards higher loadings, particularly for boiling plates, without increasing the heat-presentation areas; not quite the same zeal, generally speaking, on the part, either of supply men or manufacturers, in pushing water-heating business as there is so whole-heartedly with regard to cooking supply; really little serious thinking with regard to ordinary domestic room heating on a continuous-heating basis (not intermittent or supplementary heating), except in a few specialised cases; these are my main impressions on leaving the Scarborough exhibition.

By standardisation I refer not to the "official" work of the I.M.E.A. Electrical Apparatus Sub-Committee, but to the trend towards common practice arising out of experience and study of the consumer's viewpoint.

An eleventh-hour surprise at Eastbourne last year was the introduction of the British standard cooker. This year those responsible for that move have again created the sensation of the show by exhibiting at short notice a final model of the "British" cooker, as it is now called.

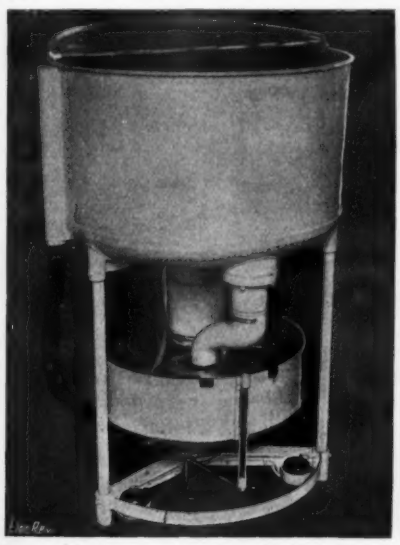
The No. 1 British Cooker

The "No. 1 British" cooker is the result of a mass of constructive criticism from every kind of purchaser and user of the preliminary samples. It is designed to serve from four to six persons. In appearance it follows conventional practice, but in detail it has been so designed that the manufacturers can mass-produce the parts and assemblies more economically than is possible with separate designs. While the general specification remains much the same there are several important modifications. The overall depth has been reduced from 26 in. to 23 in., and the width of the hob to 26 in., as compared with the overall width of 27½ in. of last year's model for up to six persons, while the oven cooking space is about the same, 13 by 13 by 14 in., as against 12¾ by 13 by 14 in. While the preliminary sample provided for either 1,600- or 1,800-W circular boiling plates of 8 in. diameter, for the higher loading in the final model 8-in. square plates have to be provided. Alternative British makes of hotplates can be fitted. Some of the other modifications are: the protection in the under structure and wiring channel against spilling-over has been extended, the switches are of the back-connected type, and separation of the switch assembly from the main front casting.

Some Cookers Compared

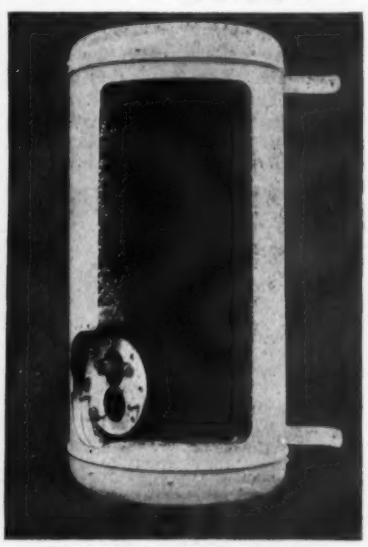
I find it very interesting to make comparisons between the "British" and other cookers. The "Efesca Media" of FALK, STADELMANN & CO., LTD., has overall dimensions of 54 in. by 21½ in. by 21 in., with oven cooking space of 14 in. by 12½ in. by 13 in. The oven loading is 1,800 W; the oven wattage of the British cooker is 2,100 W (three elements). The overall and oven cooking-space dimensions of the No. 62 Jackson (4 to 6 persons) are, respectively, 22¼ by 24¼ by 55 in. and 13¾ by 13 by 12 in. There is one boiling plate (8¼ by 6 in.), 1,800 W, and a grill-hotplate, 1,500 W. The oven loading is 1,400 W. The simplified "Magnet" cooker for up to six persons has overall dimensions of 25 by 21 by 56¼ in. and oven cooking space of 12¾ by 13 by 14 in. The oven loading is 2,100 W. There are two boiling plates, one 7 in. diameter (1,200 W) and one 8 in. diameter (1,600 W). The separate grill, 11 by 9½ in., is loaded at 1,800 W.

The increasing tendency towards the adoption of the separate grill arrested my attention. It is a feature of the British cooker, and the HOTPOINT APPLIANCE CO., LTD., make a special point of it. As a grill only the unit must be more efficient. I was pleased to note that some firms are energetically pursuing the ideal of producing a boiling plate to at least equal the gas ring in heating-up speed. In this connection REVO ELECTRIC CO., LTD., are making a strong feature of the "Superspeed" boiling plate fitted to their cookers. I also noticed "Chromalox" boiling rings fitted to a few cookers.



"Kent" Washing Machine

"Bulpitt" Wash Boiler



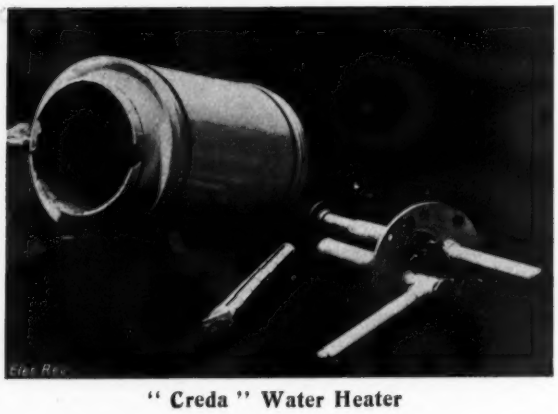
"Magnet" Water Heater

A representative of the GENERAL ELECTRIC CO., LTD., told me that since the British Industries Fair this year (ELECTRICAL REVIEW, February 20th, 1931, p. 350) several trial samples of the "Magnet" thermal-storage cooker have been sold. That is interesting news, for because of its possibilities as an "off-peak" load builder the apparatus should have a real trial.

I had imagined that the limit had been reached in attractive cooker finishes, but there is still something really new to be seen. DOMESTIC ELECTRIFICATION, LTD., have cookers finished in mottled blue, mottled brown, chromium and white, and so on, but the interesting point is that they told me there is a decided demand for "exclusive" finishes.

Cooker Control Apparatus

Cooker control apparatus is rightly being given increasing attention, and I was interested to see some newcomers into the field; BELLING & CO. and M.K., LTD., are showing some interesting examples. One by the former company is mottled vitreously enamelled and fitted with a main switch and pilot light, and also a switch, pilot light and socket for a kettle. The comprehensive display of control units by J. H. TUCKER AND CO., LTD., always impresses me, but I cannot help thinking that the necessity for 57 standardised types is in effect a plea for cooker standardisation. An interesting item which attracted my attention on the stand of CREDENDA CONDUITS CO., LTD., is the "Credastat" oven-heat regulator which automatically maintains the temperature at any given setting from zero to full heat. It replaces the usual 3-heat switch A bi-metal spiral is inserted in the side of the oven. Inside



" Creda " Water Heater

the switch casing is a mercury switch which is operated by the movement of the spiral, and the angle of tilt of the mercury switch is varied by a rotary movement with the usual pointer handle through bevel gears.

Standardisation in Water Heaters

In several cases I saw the results of efforts to come into line with the recommendations of the Domestic Electric Water Heating and Domestic Appliances Sub-Committee of the Electrical Development Association, and to meet the requirements of the water-supply authorities. The water-heater manufacturers are evidently looking at the problem at an angle slightly different from that at which the cooker question is being approached, perhaps benefiting by the viewpoint of the onlooker. The main idea behind the work of the sub-committee seems to be to eliminate makers' " pet " schemes.

The general specification of the " Creda " heaters on show by CREDENDA CONDUITS CO., LTD., provides for an outer body of lead-coated steel and an inner body of welded or

" Belling " Cooker Control Panel

brazed tinned copper. The heating element and thermostat can be withdrawn for inspection without breaking any water joints. The a.c. thermostat is of the bi-metal type and the d.c. model is of the mercury-switch pattern. 1½- to 5-gal. sizes are recommended for wash basins, kitchen sinks, &c.; 11-gal. models for one hot bath daily and supplies for washing; 17-gal. for two hot baths daily and general hot-water supply; and 30- and 50-gal. sizes for three or more daily baths and general hot-water supply. A feature of the new " Heatrae Flat 3," a new displacement-type heater by ELECTRIC FIRES, LTD., is the nickel-silver interior of the water chamber. The wall-fixing arrangements are such that the heater can be reversed, so that the inlet valve and outlet spout can be either right-hand and left-hand, respectively, or *vice versa*. A special non-return arrangement embodied in the tank prevents water from siphoning back.

The combined circulator and thermostat, " Circstat," of SANTON, LTD., is made in 1- or 2-kW models. Except that the thermostat is incorporated under the same cover the design is similar to that of the ordinary circulator. In a new range of storage tanks I saw on the stand of SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., the immersion heater, thermostat and inlet and outlet pipes are mounted on a strong, easily removable gun-metal baseplate. The pipe connections are ¾-in. inlet and ½-in. outlet on the 1½-gal. side and ½-in. inlet and ¾-in. outlet on the 5- to 20-gal. sizes.

In a new range of water heaters I saw on the stand of FERRANTI, LTD., the heating elements and thermostatic switch are contained in copper pockets, arranged either vertically or horizontally, from which they may be removed without disturbing the contents of the water container.

Nothing very Novel in Room Heating

Apart from refinements I noticed little really new in principle in electric room-heating equipment, although " new model " fires are to be seen in every direction—new finishes, fresh attempts at imitation burning coal, alteration in shapes, and so on. What interested me more was the slightly increasing attention that is being given to low-temperature continuously heating equipment, some notable examples of which I saw on the stands of, *inter alia*, YOUNG, OSMOND & YOUNG, LTD., SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., and ELECTRIC FIRES, LTD. There are signs of an increasingly general interest in the development of wash boilers. A new boiler, the " Swan Brand," shown by BULPITT & SONS, LTD., has an inner pan which can be taken out and cleaned, so that it can be used for both cooking and washing.

A Surprise Item

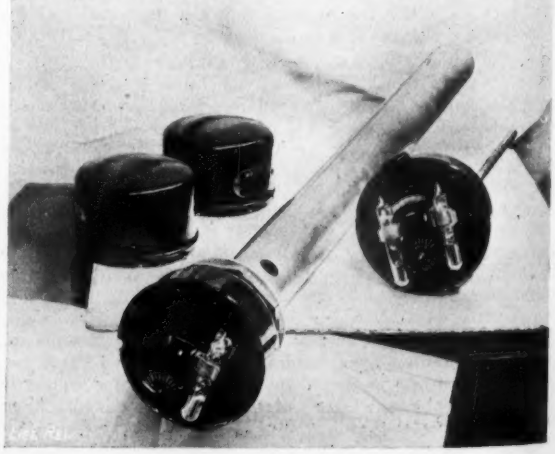
A surprise item at Scarborough is the " Kent " dish-washing machine. In the top washing-up chamber are gunmetal-casting cages for the dishes, &c., with provision for cutlery, and specially designed water-jet arrangements. Two separate tanks at the bottom are each fitted with a 2,000-W immersion heater. The water in one tank is for washing and the other for rinsing. A central lever controls the specially designed valves for the water-circulating arrangements, switches off the heaters in conjunction with the change-over from one tank to another, and alters the position of a deflector pipe for the

" No. 1 British " Cooker

return water from the washing chamber. The pumping and cage-revolving motors are suitable for all standard supplies and are rated at about ¼ h.p.

A new development of VENNER TIME SWITCHES, LTD., is the " Rad-Slot " watt-hour meter specially designed for use with fires in hotel bedrooms. It has a resetting device for zero and has a high accuracy on all loads.

The " Sbik " switch is a new departure displayed by DRAKE AND GORHAM WHOLESALE, LTD. It should prove suitable for many purposes, including cooker switching, and is made in a range of sizes of from 6 to 350 A. A trip coil is incorporated in the earth line and isolates the apparatus protected on all poles when a fault potential of 20 V arises on the casing of the protected article. The current necessary to effect the release is only 15 mA.



Santon " Circstat " and Ordinary Thermostat

The I.M.E.A Convention. The President's Address

Mr. Fuller, at the opening session, dealt with subjects of the moment, including fumes from power stations, heavy-duty switchgear, and coal washing

THERE is no doubt that the 1926 Act will improve the generation and distribution of current in this country, which was, as regards municipalities, becoming segregated into a vast number of comparatively small centres, and that, when the results are considered as a whole, the country will be more advantageously supplied with electricity than would ever have been possible under the old arrangements. I am certain that when the grid lines are more advanced there will be no reason on the part of undertakings, however small, to complain of the prices for bulk supplies.

On the other hand serious difficulties arise because so much of the country has already been allocated to power companies. The smaller undertakings find that, because they happen to be situated in the area of a power company, they must first obtain their supplies from that company.

This leads to price bargaining, and in this matter there is no consistent policy, either in the area of a company or among the companies, or even in some municipal areas. Apparently it is purely a matter of getting the highest price possible for their supplies. From a national point of view it is rather disappointing to know that most of those undertakings, which have already taken supplies in the manner previously described, have had to pay a price which is much higher than it should be. In all these cases, which at the moment are outside the direct control of the Central Electricity Board, your Council has strongly advised that a clause should be inserted in the agreements, to the effect that as soon as grid supplies are available, the contract prices would be subject to revision, and in most cases this advice has been adopted.

I am afraid I entirely disagree with the policy of the Central Board in regard to the allocation of capital charges on transmission lines. I consider that the whole cost of the grid transmission lines should have been pooled, in such a manner that no undue hardship would be inflicted on any undertaking because its geographical area happened to be further away from the source of supply than was a neighbour. Under present arrangements the longer the transmission line required to supply a given undertaking, the greater are the capital charges which would be added to the charges already agreed. The effect of this has been in many cases to involve so heavy an additional cost as to prohibit any possibility of an undertaking of this kind ever competing with plant in local factories of considerable size; what is worse, it absolutely cuts across the original idea that the C.E.B. should give a cheap and abundant supply of electricity to everybody. The prices due to this unfortunate arrangement will be such that they will in many cases stultify all progress in the domestic field. I feel that ultimately the Board will be compelled, either by legislation or otherwise, to absorb and embody in one general charge the whole of the grid and transmission lines of the country, and I venture to say that unless, and until, this is carried out the original idea will never be secured.

It is satisfactory to note that undertakings in the areas of power companies are endeavouring to secure by collective bargaining a more satisfactory price than would be obtained individually.

Mr. A. J. Fuller, M.I.E.E., is Borough Consulting and Electrical Engineer of Fulham. (*Photograph by Elliott & Fry, Ltd.*)

Domestic Supply Development

Whether it is due to constant advertising, or to the fact that the general public has at last realised the great advantages of electricity in the home, there is no doubt that during the last twelve months there has been a tremendous increase in the use of electricity for domestic purposes. In my own undertaking a large number of our complete cooking installations are fixed in premises with a rateable value of not more than £22 per annum. The electric cooker of to-day gives practically no trouble to the user, thanks to the unceasing research work which has been put into the design of the elements, insulation, and other parts, and in the near future service work will hardly be necessary. Moreover the capital cost of the cookers will obviously decrease in proportion to the increase in manufacturers' output.

Every effort should be made, by all Committees and engineers, to introduce electric cookers and other domestic apparatus at the lowest possible rental charge—even at a figure which merely represents a return of the net capital cost, spread over a period of, say, ten years, the undertaking bearing the cost of maintenance and loss of interest. Any apparent loss would be more than covered by the indirect profits, which would accrue from the very large increase in output.

The average consumption of medium-sized houses for lighting is from 160 to 200 kWh per annum, but a cooker and other domestic appliances would raise the above figure to from 3,000 to 4,000 kWh per annum.

Domestic supplies should always be given on a two-part tariff with the fixed charge giving the consumer a small advantage over any existing flat rate. The secondary charge should then be kept as low as possible, in which case a change-over to almost all-electric working should be economical—not more than ¾d. per kWh.

Power Station Emissions

It has been my lot, in conjunction with one of your past presidents (Mr. J. H. Rider) to act as joint consulting engineer to my council in the design of a 300,000-kW station, and one of our difficulties has been the elimination of sulphur from the chimney gases. The experiments made truly represent the ultimate result which would be obtained at the new station, and we are confident that the atmosphere in and around any new generating station would suffer less from pollution than is the case to-day with any existing stations. The results of these experiments are gratifying, because they at once set at rest any doubt as to the advisability of placing these stations in a populated area. The suggestion that electricity could be better generated 15 or 20 miles from a town and transmitted more cheaply than when generated in the centre of its local load, is entirely wrong, and in my own case such an attitude would have led to a tremendous increase in the annual cost of generation. I am personally satisfied that it is possible to obtain any plant, whether generators, boilers or auxiliaries, in this country, although they may not as yet have been actually manufactured. We are to-day considering a single unit with an evaporation of 400,000 lb. per hour, and I am satisfied that such a size would be economical as regards space and in operation.

Coal from the various collieries situated in England and Scotland has been analysed in order to ascertain which coal has the least amount of sulphur content. The sulphur content in British coals varies from 0.8 per cent. to over 3 per cent.

To appreciate the far-reaching effect of the proper washing of coal at the colliery I have assumed a power station using 2,000 tons of pulverised fuel per day; the amount of flue dust leaving the boilers when burning uncleaned coal, would be in the neighbourhood of 224 tons per day and when employing clean coal 40 tons per day. The quantity of sulphur dioxide discharged would be reduced from, say, 50 to 11 tons per day.

If legislation could be introduced to insist that *all* coals brought to large towns should be washed in this manner the atmosphere of our great cities would be infinitely purer than it can ever be by attempts at one or two generating stations to purify the gases emitted by a few power stations.

The design of main switchgear for large stations has become exceedingly interesting, but, at the same time, difficult. The concentrated efforts of manufacturers, and research scientists, are being devoted to evolve a switch that will be capable of breaking up to 2,000,000 kVA.

These large switches require a large amount of space. In our case a switch-room, 300 ft. by 60 ft., is scarcely large enough for our requirements, and each switch has a total weight of between 60 and 80 tons.

In regard to the Faraday commemorations, I trust that no Council, however far from London, will hesitate to send its chairman and engineer to be present at the special meeting of the I.M.E.A. and the great exhibition.

Electrical Home Service. By E. E. Hoadley, M.I.E.E.

Practical comment and experience of the consumers point of view

(Paper read at the I.M.E.A. Convention on June 16th)

IT is generally admitted by the electricity supply industry that a large proportion of the future business lies in the supply of electrical energy for domestic purposes. The personnel of the industry is convinced that the service it can render in this direction possesses many great advantages, which are impossible to obtain by other methods. Conditions of living and habits of the people vary very greatly in different parts of the country, and methods which find favour in one town would not be at all suitable in another. It is a generally accepted business axiom that the seller of any commodity should study his market. This is almost essential in the sale of electrical energy for domestic purposes in order that the supply authority may be in a position to offer suitable apparatus which will give the consumer better service than he has been getting by other methods and at a cost equal to, or little in excess of, that which he has been accustomed to. Although this may be elementary business, it is none the less important. Many a promising consumer has been lost through the installation of one piece of unsuitable apparatus and once a consumer has been disappointed it is difficult to erase the impression created thereby.

Mr. E. E. Hoadley, Borough Electrical Engineer and Manager, Maidstone.

Really remarkable is the ignorance in all stations of life as to the practical possibilities of electricity in the home. It is a real obstacle to progress. What is wanted is a very great deal more of non-technical publicity in the lay Press. It is the actual user that the industry is out to catch.

Cost of Service

It is hopeless to expect to do much business in domestic electrification unless conditions are satisfactory on the supply side; by this is implied that electricity should be supplied at a suitable price and on a suitable tariff, that facilities should exist for the hire and/or hire-purchase of the more expensive pieces of apparatus; while perhaps of equal importance is really good and efficient service in the maintenance of apparatus.

Many people may be convinced of the advantages of "all-electric homes" and even of the financial saving that will be made, but as the necessary outlay is an evil of the present and the saving a benefit of the future, it simply cannot be done. Provided that a suitable two-part tariff exists combined with a reasonable hire and/or hire-purchase scheme, there is a very large market among the middle-class householders. Experience of some 1,400 "Council houses" has shown that the average annual cost of lighting is under 50s. per annum and the consumption round about 120 kWh.

Flat Irons

From the consumers' point of view one of the most satisfactory pieces of apparatus is undoubtedly the flat iron. So impressed is the author with its pioneering effect that special efforts are made to push it, and when used on a lighting circuit the equivalent of two hours' use per week, or 13 kWh per quarter, is deducted from the total consumption and charged at the heating rate. This rough and ready method is effective; in addition to the large number of irons owned by consumers, there are in Maidstone nearly 1,400 consumers who prefer to pay five shillings per annum for the hire-maintenance of a flat iron and think it well worth the money.

The supply industry is not so deeply concerned with cleaning as it is with the other services, the reason being that the initial cost of the cleaner is out of all proportion to the revenue obtained from it. The ordinary domestic vacuum cleaner can be used for four hours for a consumption of one kWh and even at lighting rates gives a very small return to the supply authority. Its initial cost limits its field of use to a very large extent and for the above reasons the pushing of vacuum cleaners is left principally to the manufacturers and traders.

Heating

Room heating may mean much or little; it is the house entirely heated by electricity that the industry is striving for, although for many years to come it may only be the better type of middle class houses. The author has great faith in the future of low-temperature heating by tubes or panels combined with red-hot electric fires. What may be spent on electric heating was shown by the specially cold spell in February, 1929, when those people who had it were glad to use it very fully, in some cases known to the author continuously. Some interesting figures as to the cost of heating by low-temperature tubes are:—

Motor showrooms: thermostat set at 60 deg. F.; average consumption=8,176 kWh per annum and average cost at ¾d. per kWh=£25 11s. p.a.

The same showrooms: thermostat set at 45 deg. F.; average consumption=3,065 kWh per annum and average cost at ¾d. per kWh=£9 11s. 7d. p.a.

Chapel: thermostat set at 60 deg. F., heating only switched on on days when chapel is used, average consumption=4,770 kWh per annum and average cost at ¾d. per kWh=£14 8s. 2d. p.a.

School heating: the Kent County Council recently conducted elaborate tests in two similar schools, one having low-temperature tubular electric heaters and the other hot-water radiators supplied from a boiler which is oil fired. In both schools it is endeavoured to keep the same temperature; in the first case the temperature of the rooms is thermostatically controlled at 60 deg. F. and in the second a thermostat controlled by the temperature of the water in the boiler cuts out one oil burner when the water temperature reaches 160 deg. F. As the report is to be published by the Electrical Development Association, the author will only state that with oil at 3½d. per gallon, electricity must be supplied at 0.54d. per kWh in order that the overall costs shall be equal.

Cooking

Most domestic consumers who start with one electric fire can be induced to extend their use until all the heating they require is done electrically, with the exception that in winter a coal fire is used in the one room in which heat is required throughout the whole day. It must be admitted that, generally, the rates for elecricity are not sufficiently low to make a change to this service attractive.

For cooking electricity offers real advantages to the consumer, particularly with cookers of the "all-enamel' type, but she is not prepared to pay any very greatly increased cost for its advantages. In Maidstone, with over 600 cookers, at ¾d. per kWh and gas at 9.2d. per therm there are practically no complaints on the score of cost. With each cooker sent out on hire is sent a three-pint aluminium kettle of English manufacture having a flat bottom, that remains flat. Test results have shown that the speed of boiling approaches the speed of a self-contained electric kettle, but the efficiency is not so high. In a large number of houses in Maidstone with families of from two to eight persons the average consumption per head per day is 1.5 kWh, and for the last twelve months an average of over 20 cookers per month have been connected.

Water Heating

Hot-water supply in a house is a subject in which exact knowledge of the conditions that have to be met with is of the highest importance. In many thousands of small houses the hot water requirements of the inhabitants can be met electrically with profit to the supply authority and real satisfaction to the consumer. For hard water the thermostat should not be set to operate at a higher temperature than 175 deg. F., and for soft water the general setting should be 195 deg. F. Tinned-copper water containers have an extra length of life over galvanised-iron ones which amply compensates for their increased cost.

In Maidstone there are over four hundred installations of electrically-heated water, most of them consisting of a 1½-gal. tank at the scullery sink, and either a 10-gal. or 22-gal. tank in the bathroom. In a number of installations sink and bathroom are supplied from the same tank, but so far no conversion of an existing hot-water system has been carried out. A 1½-gal. tank averages 16 kWh per week in summer and 20 kWh per week in winter, while a 22-gal. tank in a bathroom where two baths per day are always taken and extra ones when visitors are staying in the house averages 55 kWh per week.

Where there is 30 ft. of unlagged pipe in a house separate lagged tanks at two points (bath and sink) give the best results. In another town where entirely independent tests are made separate tanks are advised where there is more than 20 ft. of unlagged pipe.

The Future

The author has no doubt of the future of domestic hot-water supply by electricity. The business is worthy of the greatest publicity and push on the part of the supply industry. Combined systems obtained by inserting electric immersion heaters in the hot-water storage tank of the ordinary house system, lagging the tank, and controlling the immersion heaters thermostatically or by hand, is a very suitable proposition for the supply authority, provided that the fuel-fired boiler is kept going each day in the winter period from morning till late evening.

All-electric Homes

In Maidstone there are some 300 "all-electric" homes, of widely varying size, some paying nearly £50 per annum for electrical energy, others as little as £10. In houses of widely varying size the average price per kWh closely approximates to 0.75d. Gas in Maidstone costs 9.2d. per therm and most of the "all-in" consumers are satisfied that the costs are approximately equal.

Assessment for Local Rating. By Isaac Dixon, F.S.I.

Considerations met with in applying the main principles to property occupied by electrical undertakers

(Paper read at the I.M.E.A. Convention on June 17th)

THE Rating and Valuation Act, 1925, made many changes in the law, but it did not make any material change in the principles of valuation. So far as electrical undertakings are concerned, the only change to which I should draw your attention was that which obviated the necessity for a gross assessment. Formerly both a gross and a net assessment were required for all properties, and the difference between the two was supposed to represent the average annual cost of repair and maintenance. The gross figure was frequently very embarrassing; it is retained now for properties of the house, shop, or office class. Factories and premises occupied by public utility undertakings need merely a net annual value. For property in a factory or public utility group rent has to be estimated on the assumption that the tenant will do all repairs and bear all maintenance costs; in other words, the authorities are to find a *net* rent. When the rental basis fails, there are three other methods for the valuer to choose from: (*a*) comparison with other similar properties; (*b*) valuation on the contractor's basis; and (*c*) valuation on the profits basis. Method (*a*) does not help and is dangerous. For many years past attempts have been made to apply method (*b*) to railways, docks, gas, electricity and similar undertakings, but has proved to be so anomalous that the Courts have refused to approve it, excepting in special circumstances. Though an undertaking is valuable and efficient for working, yet if it had to be provided afresh it would be conceived and laid out on substantially different lines. This is an important factor in rating, and would have to be discounted in applying the contractor's basis.

Mr. Isaac Dixon is Rating Valuer and Surveyor at Liverpool

For method (*c*) common sense and fair dealing must rule throughout the inquiry. Very briefly, the process of valuation is to estimate the gross receipts and then to make deductions for the estimated cost of working and of repairing and renewing the undertaking. Out of the balance remaining, the tenant would receive such profit as would compensate him reasonably for operating the undertaking, and the balance would be paid to the landlord as rent, subject to rates being paid on the basis of such rent.

Cumulo Valuation

Thus valuation proceeds on the cumulo basis; all parochial and other district boundaries are entirely ignored, and an estimate is made of a fair rent for the entire undertaking before the apportionment is made. The several properties are divided into two groups: the distribution mains are the directly productive works and the indirectly productive works are the offices, generating and sub-stations, the transformers, and trunk mains, &c., for they are, as it were, enabling apparatus, without which distribution would be useless.

From the cumulo net annual value of the whole the value of the indirectly productive works is deducted, thus leaving as a remainder the net annual value of the distribution mains. The values attributed to the indirectly productive works are generally arrived at on the contractor's basis (note carefully that to apportion is not the same as to value on this basis), which applies a commercial rate of interest to the effective capital value, determined by considering how much value there is in the pool to apportion. Frequently there is not sufficient to warrant 5 per cent. on the indirectly productive works. The total being limited to the amount already found, if the works get more than their fair share the distribution mains must get less, and *vice versa*. When the works have been allotted their proper share of value, the remainder is the net annual value of the distribution mains. If these are not all in the one parish the value is apportioned *pro rata* to the gross receipts in the several parishes.

Suggestions have been made that all extensive undertakings should be valued, like the railways, on an average of five years' accounts. Unless there is statutory requirement for the adoption of that basis, I am of opinion that it is wrong, for it would not lead to a correct answer to the question: "What is a fair rent?" If an undertaking is progressive, its capital will increase and the capital expended fairly reflects its earning capacity. To value on the first five of six accounting years preceding would be quite wrong, for it would assume that a fair rental value for an undertaking which has already expanded can be arrived at by valuing on the results of its operations when it was only three-quarters the size. In the case of other undertakings (possibly tramways) the injustice might work the other way.

Derating Does Not Apply

In the recent enactments granting substantial rate relief to industry and freight-transport are provisions which prevent that relief from applying to public utility undertakings. Generating stations may (i) supply energy and light to railway and dock undertakings; (ii) be part of an industrial premises supplying energy and light to the factory in or near which they are situated; (iii) supply energy and light to collieries, and be parts of the colliery undertakings; and (iv) be operated for public supply.

It is necessary to distinguish between those railways which qualify as freight-transport hereditaments and those which do not. In order to qualify for rate relief, the railway must be used for the conveyance of merchandise otherwise than by passenger train or carriage. Thus, the London tubes and the Mersey railway do not enjoy relief, and neither do their power stations. Subject to this exception, the generating stations of railway companies do enjoy relief, but it does not inure to the benefit of the company directly, because it has to be passed on to traders by way of reduction of freight rates on certain selected and specified traffics.

Generating stations in the second and third categories are derated and the relief is enjoyed by the industry, or the colliery, as the case may be. The fourth category is debarred from relief by the proviso to Section 3 (1) of the Rating and Valuation (Apportionment) Act, 1928.

There are many anomalies in rating practice as now applied to public utility undertakings, and doubtless revision of the law will receive further consideration in the future.

The National Scheme

When the principal generating stations throughout the country are inter-connected by the grid transmission lines, novel and interesting rating problems may arise. No one is a ratepayer by virtue of his ownership of property, but solely by virtue of his occupation.

The Board will exercise a supervisory control over generation in all selected stations, which may have a very material effect on the extent to which a system will be operated, and therefore it is likely to affect the rental value. As to the main transmission lines, the Board being in occupation of these will be liable for rates, but from time to time certain lines will be idle, or used to only a small proportion of their capacity, which partial use would be a justification for preferential low assessment. A contrary view would be that without the occupation and full control of the transmission lines with their full capacity (whether such full capacity is used or not), the grid system would be inefficient and therefore the transmission lines, being a necessity to the national scheme, would unquestionably command an economic rent. If the latter view is sound, the transmission lines should be assessed on a structural basis; that is to say, by applying a reasonable commercial rate of interest to the effective capital value and treating the result as the net annual value.

An authorised undertaking which takes the whole of its supply from the grid will be valued for rating purposes on the profits basis as already outlined. When an undertaking does include a selected station, the gross receipts for valuation will include receipts from the consumers, together with any receipts from the supply of electricity to the grid. The cumulo net annual value will be spread over the whole of the works and mains and the selected station itself.

Uniformity of Valuation

If two selected stations in the same region are able to produce at the same cost, but one has a greater rate burden than the other, then the overall costs of the former are greater than those of the latter. Thus it is likely that the Central Electricity Board will make more use of the latter station. The one which, by reason of heavier rates, has the greater overall cost is likely to be called upon to supply less to the grid than would be the case if it were not so disadvantaged compared with its neighbour.

Undertakings differ, and therefore it is not possible to say without an intimate knowledge of each to what extent it is reasonable for one to be above or below the average, but it does appear that the industry has no ground of complaint of over-assessment.

Uniformity of valuation is one of the declared aims of the Rating and Valuation Act, 1925. The Act does not distinguish between the several classes of hereditament. Thus, it will not be satisfied merely by achieving uniformity as between one electrical undertaking and another, but requires uniformity of valuation for all properties.

It should not be expected that uniformity can be achieved at once, or in the course of one valuation period. It is rather a thing to be striven for, and anomalies and inequalities progressively reduced from time to time.

The Value of the Lighting Load. By C. W. Sully

Illumination as a factor in the sale of electricity

(Paper read at the I.M.E.A. Convention on June 18th)

THE statistical reports of the Electricity Commissioners show that the energy sold has grown during recent years to the following extent:

kWh sold.	1922/3 (millions).	1928/9 (millions).	Percentage Growth.
For power	2,444.8	4,926.6	101%
Street lighting	58.6	127.8	118%
Lighting and domestic	657.7	2,035.7	209%

The supply for all domestic purposes has grown twice as rapidly as that for power purposes. At Wimbledon the energy sold for domestic lighting, metered separately from that sold for other domestic purposes, represents 40 per cent. of the total sold for domestic purposes. The lamp manufacturers consider that their sales of lamps for customers who buy their energy at power rates have not grown appreciably during the above period, whereas their sales of general lighting service lamps, when the above referred to lamps are deducted, have grown in a similar ratio to the domestic load. The above statements indicate that much of the increased load for domestic purposes is due entirely to the increase of the lighting load.

Mr. C. W. Sully is the director of E.L.M.A. *(Photograph by Reg. Haines)*

Load Growth

The growth of the load in a residential north London suburb has been 100 per cent.; the annual consumption per consumer rose from about 375 to 750 kWh between 1920 and 1930, partly due to increased wattage and longer use. During the last eight years the lighting load in 100 houses in each of three separate districts round London (300 houses in all) increased 71 per cent., from 258 kWh per year in 1922 to 422 kWh in 1930. All these consumers were on a flat rate and used electricity simply for lighting purposes with the possible addition of an electric iron or some other small appliance. The domestic lighting load has a stabilising influence upon the revenue of the authorised undertaking. "The domestic lighting consumer does not go on strike, and his alimentary industry does not get depressed; he must have light, so that 'en masse' he is a good base load."

Since the war the number of dwellings wired in this country has grown only to the same extent as the number of new dwellings built, and there are still some seven million houses at present unwired, as is shown by the attached diagram; hence there is much yet to be done in connection with wiring the homes of Great Britain.

During the recent national shop lighting campaign nearly 17,000 shops were surveyed, 1,367 being situated in the London area and 15,344 in other parts of Great Britain. The results indicate that only 43 per cent. were using proper window lighting equipment; only 15 per cent. were using after-hour lighting; only 7 per cent. were using outside electric signs; and only 1.2 per cent. were using illuminated facia signs.

Modern architectural lighting has definitely increased the load factor of stores; the following figures concerning a store in Leeds can be quoted as an example:—

Year.	Connected Load, kW.	kWh Consumption.	Load Factor.
1928 ...	120 ...	115,896 ...	22%
1929 ...	134 ...	350,226 ...	33%

In the case of hotels and restaurants the following examples show how satisfactory their load factors are becoming under modern lighting conditions:—

	Connected Load, kW.	kWh Consumption.	Load Factor.
Hotel and restaurant	34.24	85,304	28.4%
Public restaurant ...	85.56	220,144	29.4%
Large restaurant ...	161.00	1,020,273	63%

A recent survey of a large number of hotels throughout Great Britain indicates the opportunities that still exist for increasing the lighting load in this direction.

Load Factor and Peaks

There appears to be no reason why a peak load, provided it pays, should not be encouraged, whether due to lighting, heating, or cooking. The practice of concentrating on the development of off-peak loads and ignoring the development of loads at peak times is bad commercially, provided each type of load bears its equitable share of expense. It has now been definitely ascertained that the full development of the lighting load, while increasing the peak automatically, improves the load factor, the reason being that the better the artificial lighting conditions the longer the period of lighting. When illumination is employed to its fullest extent the load factor obtainable from many lighting loads is well above the average of 31.6 per cent. throughout Great Britain in 1928/29.

Street Lighting

The advantage of this load is obvious as it frequently produces a 50 per cent. load factor, and some authorised undertakings have found street lighting to be such a valuable incentive to electrical development that they have willingly installed new and expensive systems because of the improvement in shop lighting which has resulted therefrom.

A questionnaire resulted in returns being received from 196 authorised undertakings throughout Great Britain, and the following data collected from those returns will be of interest:

Number of Authorities.	Proportion of electric to gas street-lighting standards.
12	Nil.
45	Up to 25%
22	Over 25% and under 50%
29	Over 50% and under 75%
44	Over 75% and under 100%
44	Over 100%

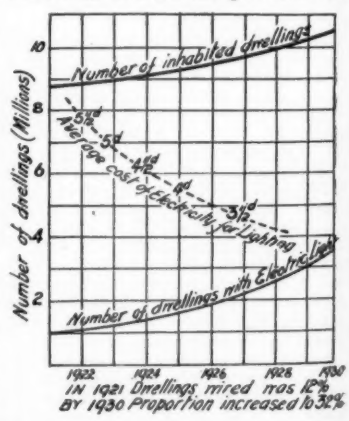
The total number of street-lighting standards within the areas of these 196 authorities is 446,000, of which 178,000, or 40 per cent., were electrically lighted. It has recently been estimated that the total number of standards throughout Great Britain is 670,000, and on that basis the above analysis deals with not less than two-thirds of the standards used throughout the country. If 10 per cent. of the remaining 224,000 standards are electrically lighted, then there are to-day some 470,000 street-lighting standards yet to be converted from gas to electricity, and capable of absorbing another 300 million kWh per annum. The standard of lighting to-day is by no means satisfactory in the light of modern demands and varies to such an extent that it frequently becomes a danger rather than an assistance to the motoring public in paricular.

Finance

The Electricity Commissioners' reports show the growth of revenue from various sources to be as follows:—

	1922-23.	1928-29.	Percentage Increase.
Power	£13,190,000	£17,635,000	34%
Street lighting ...	£599,000	£898,000	50%
Lighting and domestic	£14,534,000	£25,863,000	78%

During the last six years the growth of revenue from lighting and domestic load has more than doubled the growth of the power load and is now producing a much greater revenue than any other section, in spite of the fact that the average price obtained per kWh sold for lighting and domestic purposes has dropped during that same period from 5.30d. to 3.05d. Where flat rates still exist the charge for lighting is certainly more than 3.05d. and the charge for other domestic uses is much less. Where the two-part tariff is employed the charge is generally under 1d., and the fixed charge is often calculated on a basis which ensures that the normal requirements for lighting will be paid for at something approaching the old flat rate. This means that the revenue obtained from lighting to-day is equally valuable to the undertaking as any other revenue, even if its load factor is only a fraction of that obtained for power purposes.



Lamp Quality

Lamp quality should also be kept before customers, for there has been an increased light output throughout the life of the lamp of not less than 13 per cent. This means that the light obtained from a 60-watt lamp over a thousand-hour life at 3d. per kWh costs to-day:—

	s.	d.
60 kWh at 3d.	15	0
Cost of lamp	1	10
Total price	16	10

On this basis lamps made to the latest B.E.S.A. specification could cost 1s. 11d. more than lamps made to the previous specification without representing any actual loss to the user. The average test lives of all the more popular lamps manufactured by E.L.M.A. members exceed 1,500 hours.

Distribution Development. By A. Nichols Moore, M.I.E.E., M.I.Mech.E.

Railways might take Six Thousand Million Units a Year

(Paper read at the I.M.E.A. Convention on June 18th)

THE financial success of the Central Electricity Board's scheme depends in a great measure on the accuracy of the estimated ultimate cost of production and upon the absorption of the increased output of energy within a predetermined period. Those figures disclose an important fact. Assuming that the estimates will be realised, the average gross saving in generation cost will only be of the order of 0.0554d. per unit sold. In other words, this is the improved economy in production which can be anticipated when the national scheme is fully established; further economy can accrue only by effecting a reduction in the average cost of distribution. If this reduction could not be effected, the position would be that the present average price of 1.42d. per unit sold to the consumer could be reduced only by a small fraction. Distribution therefore assumes a position of overwhelming importance in the popularisation of electricity.

Examination of the data available over a period makes it possible to gauge with some degree of confidence the general trend of development. The period 1921/1930 indicates that the consumption for domestic purposes has quadrupled, and the percentage ratio to total units has increased from 16.5 to 27 per cent., whereas, whilst in the case of industrial power the consumption has more than doubled, the ratio of total units has steadily declined from 71.5 to 62.4 per cent.

As electricity for industry and commerce preponderates, it clearly demands priority of attention, for to them we look for a revival of trade and the absorption of unemployed labour. Only by such development can the national scheme of generation hope to succeed, for whilst electricity for domestic purposes will undoubtedly make a valuable contribution, it must still remain to industry, with its higher load factor and great capacity for the absorption of energy, to create the largest demand upon the grid.

Private Plant

The transfer to public supply of electricity generating plant in private ownership would constitute a most substantial increase in the national consumption. The total capacity of such plant in Great Britain at the present time is estimated at 3,000,000 kilowatts and the consumption at 4,300,000,000 units per annum.

Private generating plant was granted under the Rating and Valuation (Apportionment) Act, 1928, relief to the extent of 75 per cent. This differentiation in treatment is very unfortunate, as obviously it will hamper transfer, and therefore in the interests of the national scheme of generation should be rectified. It would appear that as a result of derating, the installation of private generating plant still continues. The change taking place in the United States in the transference from primary steam power to electric power, with a consequent rapid increase in the degree of electrification in industry, all helping to a more complete rationalisation of electric power, is particularly significant. There is surely no reason why similar conditions should not obtain in this country. Electricity for industrial purposes can be obtained in Great Britain at lower rates than in the United States, the average cost of power being 0.86d. per unit in Great Britain as compared with 1d. per unit in the United States. The position is similar in relation to certain Continental countries.

Primary mechanical horse-power available for conversion at the present time exceeds 7,000,000 h.p. Assuming it were possible to secure the transfer of only 50 per cent. of this load, it would represent, on the basis of a 40 per cent. load factor, an additional national consumption of some 9,000,000,000 units per annum, equivalent to an increase of over 100 per cent. on the present total units sold by authorised electricity undertakers for all purposes.

Railway Electrification

Another undeveloped source of increased consumption is the electrification of main-line railways. It is estimated that a general system would represent a consumption of some 6,000,000,000 units per annum and, particularly having regard to its high load factor, react beneficially on the cost of energy produced for all purposes.

Importance of Power Factor

The general effect of low power factor is well known and too little regard has been paid to it in the past. The percentage loss is a serious consideration in reducing cost. It has been suggested that the capital and maintenance costs of transmission are possibly 50 per cent. higher than they would be at unity power factor. One would be almost justified in stating that the operation of plant at low power factor should be prohibited by statutory regulation, and an investigation of this subject as a means to improved distribution cost is strongly recommended.

Domestic Load

The most substantial increase in domestic consumption will of course arise from the development of cooking and water heating. Bearing in mind that it is reliably estimated that there are some 9,000,000 gas cookers in service in Great Britain, the potential cooker demand will be easily appreciated. If only 10 per cent. were replaced by electric cookers, it would represent some 1,080,000,000 additional units per annum.

It is the duty of all public supply authorities to put into operation as soon as possible some form of hire-purchase scheme on a sound financial basis. Not to do so would be to arrest development by placing obstacles in the way of consumers. The general prejudice against the system is happily disappearing. The enormous disparity between the cost of apparatus complete and ready for shipment at manufacturer's works and the list price at which it can be sold to the consumer will have to be radically adjusted before we can hope to see the great increase in domestic electrical service which is anxiously desired.

Mr. A. Nichols Moore is Borough Electrical and Tramway Engineer of Newport, Mon. *(Photograph by Elliott and Fry, Ltd.)*

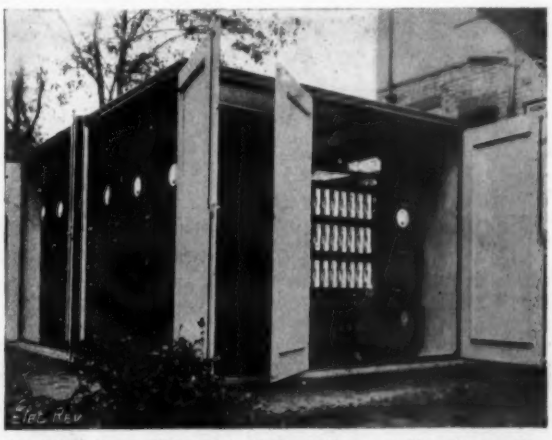
Rural Electrification

The future development of rural areas cannot at present be envisaged with any degree of certainty, nor is there at present sufficient evidence that the economic problems involved are capable of a completely satisfactory solution. Whilst judged from the national standpoint, rural electrification may be a national necessity and an important feature of distribution development, it may still be that, if considered as an individual class upon its own merits, much of it may prove to be economically unsound, and therefore cannot be fully developed on a commercially profitable basis, even over a period of years, if the supply is to be debited with its full share of working costs, including capital charges. If rural schemes are ever to be a commercial success, the provision of a full and unrestricted supply of electricity to the consumer is essential.

National Distribution Boards

As neither joint local authority administration over extended areas nor private control by a limited number of public utility concerns would appear to be a completely satisfactory solution of the national problem, the business of distribution should be directed by a Central Electricity Distribution Board operating through Regional Electricity Distribution Boards, on which the various existing interests would be suitably represented. The whole problem of national distribution would then be dealt with under a unified system co-ordinated with generation.

The Central Distribution Board, which would be appointed by the Minister of Transport, would function as the authority in supreme control of distribution. All local authority and company undertakers, as such, would be eliminated and their undertakings transferred to, and vested in, the Board upon terms to be agreed. The Board should be able to exercise all those statutory powers now possessed by existing authorised undertakers, in particular their powers as to the sale of electric lines, wiring of premises, supply of fittings, apparatus and appliances for lighting, heating and power, and generally for all purposes as provided under Section 48 of the Electricity (Supply) Act, 1926.



Steel-kiosk, 1,000-kVA Sub-station at Scarborough
(see p. 1034)

The Regional Distribution Boards, which would be appointed by the Minister of Transport, would function as the executive authorities for distribution. Each Regional Board would be at liberty to employ as its agents the existing staffs and showrooms of authorised distributors, and such approved electrical contractors in its area as in the opinion of the Board were fully competent to carry out the work. Probably in the course of time the whole business of distribution service would devolve upon the Regional Boards for all practical purposes, this, after all, being only what has become the recognised organisation in the gas supply industry. The interests of all county and local authorities could be safeguarded and encouraged by empowering them to make direct representations to the Regional Board on any matters affecting local distribution. Any differences arising on which a reasonable settlement could not be effected as between the Regional Board and the authority would first be referred to the Central Distribution Board for advice, and then submitted to the Electricity Commissioners, whose decision would be final and binding upon both the Regional Board and the authority.

Finance

The financial operations necessary to effect the transfer of the existing undertakings, although involving a present vested capital of some £330,000,000 and affecting long-established interests and complex monopolies, would be basically simple and not create any real disturbance of capital. The draft clauses of Parts II, III, and VI of the London Passenger Transport Bill would appear to provide a suitable basis, for although it may be contended that this is rather too definite a step towards ultimate nationalisation, it at least has the advantage of precedent. It might also be contended that the issuing of national distribution stock by the Central Electricity Distribution Board in exchange for the undertakings would carry with it the definite control and management of all revenues, but probably such an issue would constitute a higher security than distribution stock issued by the respective Regional Boards, and would therefore be more favourably regarded by the investing public.

An industry possessing a total revenue of some £56,000,000 per annum, equivalent to about £18 per £100 of invested capital, and a gross profit of some £26,000,000 per annum, representing approximately 8.9 per cent. upon the invested capital, must obviously be regarded as a highly prosperous industry which must inevitably not only maintain, but increase its present measure of prosperity. Under such circumstances there could be little doubt of the success of the issue of distribution stock on the lines proposed. Under the present organisation some £450,000 was appropriated last year for the relief of local rates, in effect, money taken out of the industry.

Broadly, therefore, under the general control of the Central Distribution Board there would be Regional Distribution Boards operating as complete independent entities, issuing regional distribution stock under conditions and terms settled by Act of Parliament, dealing with its own finances, meeting all charges and interest payments, providing for redemption, reserve, superannuation and compensation, and administering surplus as may be decided as being in the best interests of the consumers and of the industry. The financial operations, being consolidated, would be reduced to the simplest form and the legal complications, unavoidable in the present system, would largely disappear.

Prompt Attention Needed

Such far-reaching proposals will no doubt arouse considerable controversy. The future development of electricity distribution is a problem that calls for prompt and statesmanlike consideration, and a solution of the national problem cannot be much longer delayed. In every country where the density of population is sufficiently high a process of co-ordination of resources, with power supply as the main instrument, is taking place, and in the richer and more compact countries the central feature of development is in the rationalisation of power distribution.

This rationalisation is an inevitable economic development. There is a danger that the present organisation of electricity supply may tend to hinder the economic consummation of the complete rationalisation of power supplies for all economic activities. That is to say, the fact that the ownership of power supplies and distribution in most countries is in private or in public hands, and that private enterprise will strenuously resist any attempt at a monopoly by the state or a quasi-state organisation, including the control of private generating plants, is a consideration which cannot be overlooked or lightly disregarded. The economic tendency of the immediate future must surely be towards the amalgamation and centralisation of the whole industry.

The Vice-President of The I.M.E.A.

MR. C. G. MORLEY NEW has been City Electrical Engineer at Cardiff since 1920, when he succeeded Mr. Arthur Ellis for whom he had acted as deputy engineer for the previous 13 years.

During his period of office, the maximum load on the undertaking has increased from 5,871 to 20,200 kW, the kWh sold from nine million to 44 million, and the number of consumers from 5,207 to 35,105. Of the latter, some 10,000 have been brought in by the assisted-wiring schemes introduced in June, 1927, which to date have cost £95,000 and which with showrooms, hire-purchase and cooker-hire schemes, and an "all-in" tariff for domestic consumers constitute the basis of an active load-building organisation.

To cope with this development the generating plant has been reconstructed and its capacity has been increased in 11 years from 9,000 to 34,000 kW; the present power station, incidentally, is one of the seven in the S.W. England and S. Wales area selected for operation by the Central Electricity Board. Under Mr. Morley New's regime some 400 miles of cable of all kinds have been laid and the frequency of the older system has been changed from 40 to 50 cycles; very few streets are now without mains. Altogether Mr. Morley New has been responsible for a capital expenditure of close on £1,000,000.

Mr. Morley New's association with Cardiff is a long one. He served his time (five years) with S. F. Walker & Co., of Cardiff and Newcastle, and after a pupilage at Leeds Corporation electricity works, he became (in 1900) assistant charge engineer at the time of starting up of the two-phase system there. Two years later he returned to Cardiff as charge engineer with a view to obtaining traction experience, which was then considered so desirable. In 1903 he became general technical assistant at Cardiff, until in 1907 he was promoted to Deputy City Electrical Engineer for the electricity and tramways departments, as indicated above.

During the war he "joined up" and was employed in assisting Mr. Arthur Ellis in organising, equipping, and operating a shell factory at the car repair shops; this factory was probably unique in relying entirely on voluntary labour.

Mr. C. G. Morley New, M.I.E.E., is the City Electrical Engineer of Cardiff. (*Photograph by Elliott & Fry, Ltd.*)

Apart from the duties outlined above, Mr. Morley New has been very active in promoting the welfare of his profession and industry in its myriad aspects. Thus, he has served for several years on the committee of the Western Centre of the I.E.E., of which he was chairman in 1927-28. He has been a member since 1920, his connection with the Institution as an associate member dating from 1910. He reported on "Domestic Applications of Electricity" in the *J.I.E.E.* of January, 1930. He is a member of council of the S. Wales Institute of Engineers, chairman of the Cardiff and District Electric Circle of E.D.A., and a member of council of the E.R.A. He also assisted, some four years ago, to form the S. Wales Branch of the E.A.W., of which Mrs. Morley New is chairman.

Mr. Morley New has been prominent in the affairs of the I.M.E.A. since 1926, when he became a member of Council and of several committees. His most recent work has been as chairman of the Electrical Apparatus Committee and, of course, of the joint committee formed to consider the cheapening of cookers by standardisation.

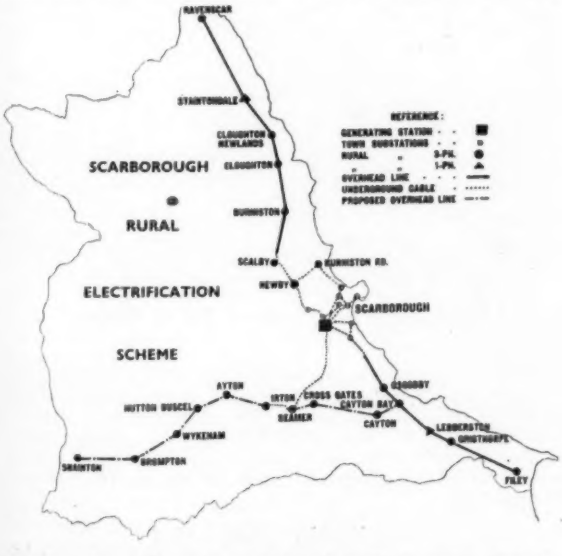
Electrical Development in the Convention Area

Progress made by the Scarborough, Bridlington, and Whitby Undertakings

Scarborough's Activities

MUCH credit is due to the electricity undertaking of the Scarborough Corporation for the advance it has made under the managership of Mr. Edward J. Jarvis, A.M.I.E.E., borough electrical engineer and manager, since the concern was purchased from the Scarborough Electricity Supply Co., Ltd., in 1926. The advance represents a fight against considerable odds, for both the power station and the distribution system at the time of the acquisition were very much out-of-date and, indeed, practically obsolete when considered in terms of modern technique. The purchase price of the concern was £173,000, which amount represented almost wholly goodwill. The capital expenditure of the undertaking at March 31st, 1928, was £207,000, and at the corresponding date this year it was £492,000, the difference in the two figures being, in effect, initial expenditure. Further, the undertaking is in competition with a very influential gas company, which is able to offer unusual facilities to its consumers. Gas is supplied at 9d. per therm.

Scarborough has now a total of about 5,000 consumers of electricity. In 1926 the figure stood at 2,363. The maximum load for last year was 2,840 kW, and the load factor 34.6 per cent. A campaign to secure domestic supply business was started a couple of years ago, and at present there are over 400 cookers and 80 wash boilers connected



to the mains. There is no two-part tariff in vogue, but an all-in cooking and heating rate of 1d. per kWh has been established. Lighting only is supplied at 7d. per kWh and power at 2½d. per kWh. The general rates for the outer areas represent an addition of 10 per cent. on the town charges. An assisted wiring scheme was started a little over a year ago, and has resulted in 246 consumers of that class for the first year's working, but consumers are now being connected at a much increased rate. Last year the concern transacted hire-purchase business to the gross value of £4,000, and assisted wiring business totalling £1,500. Cookers for five to six persons are hired out at 5s. per quarter for the whole installation, including a separately-operated 3-pint kettle, a control unit, and 30 ft. of wiring.

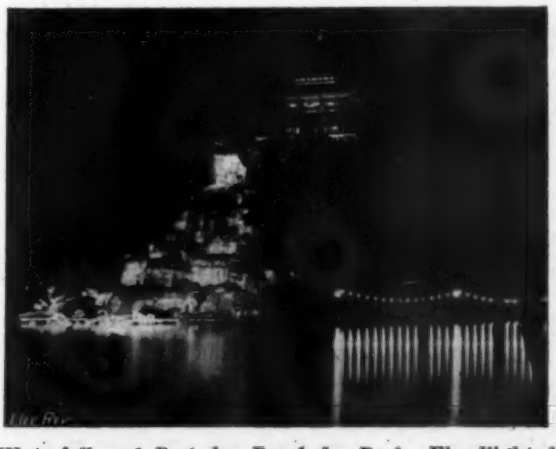
The undertaking has a very attractive showroom at Westborough, with a well-laid-out demonstration room at the back with accommodation for seating 80 persons. On an average a lecture-demonstration is given in the showrooms every week, and there is an average attendance of 60 people on each occasion. The lecture-demonstrations are followed up by similar work in consumers' houses. A lady demonstrator is permanently employed. The concern also runs its own installation department, with up to 40 wiremen, and last year a profit of £2,000 was made on sales and installation

Some of Scarborough's Electrical Illuminations

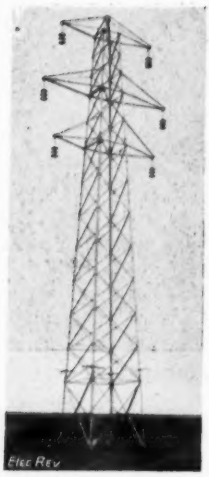
work. In addition to the ordinary domestic work, the undertaking has done considerable business in connection with large cooking equipment for caterers, bakers, &c., and large cookers are installed in all the Corporation cafés in the town. In four science schools in Scarborough the department has installed free for educational purposes cookers and irons—a highly creditable move. Regular advertising in the local Press is an important part of the business-getting activities of the organisation.

But domestic supply is not by any means the last word in the Department's activities, for it has a very satisfactory and steadily-increasing industrial load. In this connection one comparatively new consumer, the town's water-supply department, is of outstanding interest because of its valuable load—252 kW with 18 hours per day running in normal times and 24 hours per day during the season. A visit to the waterworks at Irton is an item in the Convention programme for to-morrow (Saturday). The plant is in duplicate and will deal with 2½ million gallons of water per day per set. There are two vertical turbine pumps for a low lift of 30 ft. from the well, each driven by a 30-h.p. vertical short-circuited-rotor motor, 720 r.p.m., and four horizontal forced pumps each served by a 120-h.p. motor, 970 r.p.m. The latter are for high-lift purposes to the supply reservoir under an average head of 312 ft. The depth of the well is 400 ft., and the low lift for the vertical pumps is explained by the very adequate natural water supply under the area. One of the vertical pumps and two of the horizontal machines complete one of the supply equipments, the second set acting as stand-by. There are two switchboards of special design, each consisting of two 120-b.h.p. units for the force pumps with ironclad oil-immersed draw-out pattern circuit breakers, two overload relays with adjustable time-lag devices, low-voltage releases, ammeters, watt-hour meters, and two oil-immersed auto-transformer starters. There is also a unit for each of the well pumps, consisting of one auto-transformer starter with triple-pole oil-immersed switches with a no-volt and two overload releases. The main contractors for the whole of the plant were Harland Engineering Co., Ltd., who manufactured both the pumps and motors. There is little need to say anything about the part played by the department in the general activities of the town towards its success as a holiday resort. The floodlighted buildings, &c., and the particularly fine illuminations on the sea front are convincing indeed.

Scarborough Corporation has entered into an agreement



Waterfall and Pagoda, Peasholm Park, Floodlighted



S. to B. 33,000-V Line Tower

with the Central Electricity Board to supply in bulk to Bridlington, and the work in connection with the scheme is now well advanced. The Board has a sub-station adjacent to the electricity works site, and the supply voltage for the initial period will be 33,000. The Scarborough station is "temporary selected," and the final scheme provides for a supply to the town from the grid by means of a 66,000-V line from York, the route of which will be *via* Malton.

Generation and Distribution

The power station as it stands now is practically a new one, the progressive scheme of modernisation which was started in 1926 being now nearly completed. The total generating-plant capacity is 9,375 kW, made up of two 3,750-kW and one 1,875-kW turbo-alternator sets, 3-phase, 6,600-V, 50 cycles. The alternators are solid coupled through transformers which step up the generating pressure to 11,000 V at which all the main switching is carried out. At present a 1,000-kW frequency changer forms an important part of the turbine-room equipment, for the distribution system is being converted from 80- to 50-cycle working. As a stand-by two of the old 80-cycle Parsons turbo-alternators are being retained.

The boiler-house equipment consists of two "Combustion" steam generators, each rated at 37,500 lb. per hour, maximum, and one 25,000-lb. Babcock & Wilcox boiler. The larger equipments are fitted with air heaters, and the whole are stoker fired. New coal- and ash-handling plant has also been erected at the station. The circulating-water cooling for the station is effected by cooling-tower plant, and the make-up is supplied from two wells on the site, which together will give 6,000 gal. per hour.

Although considerable progress has been made in the change-over of the distribution system, in conjunction with which new mains are being laid throughout the town, the work of the undertaking is being handicapped because of the inadvisability of putting more load on the old mains, which consist chiefly of 7/16 rubber-insulated cables in iron pipes.

There are in Scarborough nine single-phase and 18 three-phase, 11,000-V sub-stations, the latter consisting principally of large steel kiosks, in some cases housing two 500-kVA transformers complete with all necessary control gear, on both the high- and low-pressure sides, supplied by the English Electric Co., Ltd. Contracts have already been let for the extension of the system of supply on the north, so as to include the villages of Burniston, Cloughton, Staintondale, and Ravenscar, and on the west to bring in Cayton, Seamer, Irton, East and West Ayton, Wykeham, Ruston, Hutton Buscel, and Snainton.

The poles used for the supply to Filey are of the steel lattice type; the line is designed for 33 kV, but it is at present operating at 11 kV. The poles on the other portions of the system are of wood, with metal cross arms. The conductors in each case are steel-cored aluminium, with an area equivalent to 0.1 sq. in. copper. On the small rural lines the insulators are of the 22-kV type. The rural sub-stations will be pole-mounted, with 50-kVA transformers controlled by air-break switch-fuses operated from the ground.

A large school with a scholar capacity of 800 which is at present being built in Scarborough is an outstanding example of construction and architecture; the design was put up for competition. The electricity undertaking has secured the business for heating this building, and the load will be in the neighbourhood of 300 kW.

Change of System at Bridlington

The Bridlington undertaking is also in the midst of putting down new mains for the change-over of the distribution system from three-wire d.c. to three-phase, but because there is no a.c. at present the whole change-over will be done in one move, which is anticipated to take place in January, 1932, although it is hoped to give a limited three-phase supply by the end of this month. From the grid sub-station which is being erected and which will receive at 33,000 volts, a ring main will serve four kiosk sub-stations in the town at 11,000 V. The kiosks are being supplied by Crompton Parkinson, Ltd., with Ferguson, Pailin switchgear. From these sub-stations the existing three-wire network will be supplied at 230-0-230 V single-phase. In the heavily-loaded portion of the town the system will be 400 V, three-phase. As the new pressure will be only 10 V in excess of that of the existing d.c. supply, it will be possible, with the exception of motors, to carry on with the existing consumers' apparatus.

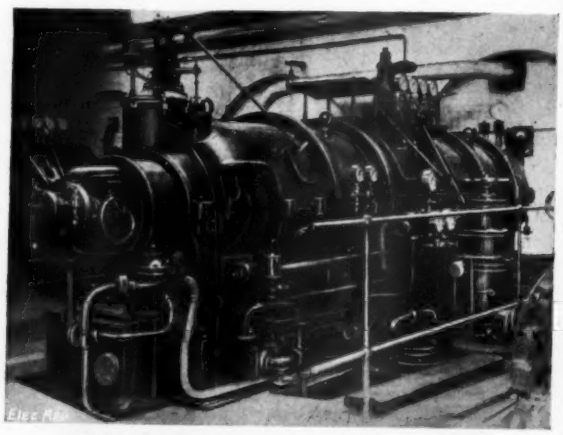
The new cables are l.c., p.i., and laid direct. They are all of Callender's manufacture, as are the whole of the cables on the existing system. The grid sub-station will incorporate two 22,000-kVA outdoor transformers, with on-load tap changing, and Reyrolle e.h.p. switchgear in the control sub-station, where there will be provision for local-supply transformers. The estimated cost of the change-over scheme is £45,000.

Capt. A. J. Beckett, M.I.E.E., the electrical engineer, is proud of the fact that since its commencement in 1904 the undertaking has not once been a burden to the ratepayers, and also because the outstanding capital on the generating plant has been reduced to only about £10,000.

The whole of the street-lighting in the town—703 lamps—is electrical; it is on separate mains and remotely controlled. The rural area around Bridlington is served by the Buckrose Light and Power Co., but a clause in the supply Order provides for eleven parishes to be taken over by the Bridlington undertaking in the event of them being taken in the borough. By a special arrangement with the Power Co., a bulk supply will probably be given to Flamboro' from Bridlington within the present year.

The grid charges to the undertaking are to be £3 10s. per kW and 0.36d. per kWh, plus a coal clause. This is about the same as the present cost of generation, but the engineer is disappointed because the department's profit will be £3,000 per year down due to the cost of change-over, the loan for which has been sanctioned for only seven years.

Tariffs at present in vogue are: lighting, 6d. to 4½d. per kWh; power, 4d. to 1½d. per kWh; and domestic supply



1,500-kW Turbo-alternator Set at Whitby

(cooking and heating), 1d. per kWh. There are at present 3,700 consumers on the mains, out of a total population of 25,000. The kWh sold for 1929-30 amounted to 1,861,347. Although it has not been possible to encourage rapid growth of the domestic load, it is creditable that there are at present over 300 cookers and wash boilers out on hire and hire-purchase.

The Whitby Undertaking

Electricity supply was commenced at Whitby in 1902 with Parsons d.c. turbo-generators, which have now been replaced by two 1,500-kVA Brush-Ljungström turbo-alternators. The converting plant consists of one 250-kW "Metrovick" rotary convertor and three mercury rectifier equipments, totalling 800 kW, of "Hewittic" manufacture.

The department has had control of the whole of the street lighting in the town since 1905, and some idea of the domestic-supply activities of the concern may be gathered from the fact that one third of the total kWh sold are for heating and cooking. There are 124 cookers installed on the system, and two cafés in the town are all-electric. Two bakehouses are using electric ovens. A new showroom was opened by the undertaking last year, and the resulting business has been very encouraging to the chief electrical engineer, Mr. J. W. Piggott. Consumers are helped by hire-purchase terms and an assisted wiring scheme.

Contracts have been entered into for carrying out extensions under the Whitby Electricity (Extension) Special Order, 1930, to the villages of Robin-Hood's Bay, Thorpe, Sleights, and Sandsend, at a cost of about £12,000. Other items of electrical interest at Whitby are an electrical swing bridge, erected in 1908, automatic sewage pumping stations, lighthouses, and cliff shaft lifts recently opened for this holiday season.

The British Market for Electrical Manufacturers

After showing the extent to which foreign electrical goods are now imported, Mr. Dunlop tells how great the market will be and how it can be secured by home manufacturers

IN the year 1930 Great Britain bought nearly £2,000,000 of electrical goods and machinery from the United States and the same amount from Germany. She is the second most important market, after Canada, for United States' electrical exports, and the second most important market, after Holland, for German exports; while her own exports to these countries, which are her strongest competitors in electrical manufactures, are negligible.

In 1924 the total value of electrical apparatus consumed in Great Britain was roughly £33,500,000, of which about £3,370,000, or 10 per cent., was supplied by imports from abroad. In 1930 the total value consumed was about £50,000,000, of which £7,000,000, or 14 per cent., was supplied by imports. From this it will be seen that even over the last seven years, the foreign electrical manufacturer was increasing his hold in this country. This, in itself, is sufficiently serious, but it becomes all the more so when one realises the size of the future market for these goods in Great Britain.

The main electrical items which Great Britain imports are certain types of insulated wires and cables, wireless instruments, batteries and accumulators, electric light fittings and accessories, commercial and scientific instruments, house-service meters, electric bell apparatus, household cooking, heating, and refrigerating apparatus, and lamps. All these, with the exception perhaps of insulated wires and cables, are items which the individual consumer purchases for himself. It is therefore left largely to his choice whether, through his purchases of electrical apparatus, he is going to do his part to relieve unemployment in this country or in the competitor countries.

If the consumer made an investigation he would find that, in the long run, it would pay him better, on the grounds of efficiency and reliability, to buy British-made electrical apparatus, even if it costs a little more than the corresponding imported article. If he does not want to take the trouble of making an investigation, then he could be reminded that, by spending on the British product this little more, which represents a very minute fraction of his ordinary living expenses, he would be doing a great deal to help the present and future employment position in this country.

The future market for electrical apparatus in this country

How valuable a customer this country is for the produce of its main competitors in electrical manufactures has already been shown. One can be certain, moreover, that these competitors realise as well as do our own manufacturers the opportunities which exist for the sale of electrical apparatus in the next ten years. When the extent of those opportunities is realised it will be seen that some definite steps will be necessary to ensure that the home market for these goods is maintained for the British manufacturer, and that the share of the foreign manufacturer, if not lessened, is at least prevented from increasing any further.

Only about one-fourth of the houses in Great Britain are at the present moment wired for electricity; while the degree of industrial electrification is about 25 per cent. less than that in Germany and the United States. In addition, the electrification of rural areas is only in its infancy. From this it will be gathered that Great Britain is still far behind in the development of electricity supply. The next ten years will see much growth in this sphere. The plans for an electricity "grid" covering the whole of the country are now complete; and the "grid," when it is in operation, will bring 98 per cent. of the population of the country within reach of electricity. This availability of electricity will so extend its use that consumption by 1940 will be at least 80 per cent. higher than the annual consumption of electric current at the present time. The corresponding increase in the use of electrical apparatus will be very considerable. A good deal of this will be represented by apparatus and appliances for the industrial use of electricity; but the bulk of it will be for domestic and public lighting purposes. Such apparatus would include all the items referred to above, with the exclusion of wires and cables.

Mr. D. N. Dunlop, O.B.E., is Director of the British Electrical and Allied Manufacturers' Association. As its official head since 1911, and through many committees he has had to face practically all the problems of our industry.

In 1930, the total sales of such apparatus in Great Britain amounted to about £36,000,000. In 1940, with practically the full operation of the "grid," the sales can be estimated to be about £58,000,000. If we assume a steady expansion in the sales of this apparatus over the next ten years, the total value of apparatus sold in this country during that period can be estimated at approximately £460,000,000.

The number of houses wired for electricity at the present time is approximately 3,000,000, out of a total of slightly less than 11,000,000. By 1940, the number of houses wired should not be less than 7,500,000, giving an addition to the number of houses wired during the ten-year period of 4,500,000. The present average cost of a wiring installation for a house is about £7 5s. It is likely that this cost will fall within the next few years; so that the average for the ten-year period can be put at £6 5s. per house. The total value represented by wire and wiring material will therefore be approximately £28,000,000 which, when added to the value of the consumers' apparatus, gives a final total of approximately £490,000,000. This represents the total value of the market for electrical apparatus in Great Britain over the next ten years.

The necessity for buying British electrical apparatus

Even if the proportion of this amount represented by imports from abroad does not increase, the total value of these types of electrical apparatus supplied by the foreign manufacturers to this country over the next ten years will amount to roughly £68,500,000, or, say £6,900,000 per annum. The total value of electrical apparatus imported during 1924-30 was £34,000,000, or £4,900,000 per year. This has represented a loss to employment in this country of about 10,000 men per year. If this position with regard to imports is allowed to continue, the corresponding loss in employment during the next ten years will be about 14,000 men per annum.

If we put this in terms of loss of wages to the country, the average loss over the last seven years has been about £1,900,000 per year, or £13,300,000 for the whole period; while for the next ten years it will amount to £2,700,000 per year, or £27,000,000 for the ten years. Such a loss is too large to be ignored, particularly as in every case the apparatus which is imported can be supplied in this country.

Moreover, the apparatus produced by British manufacturers is, in most cases, more reliable and better suited for use in this country than the corresponding imported article. The reason for this, in the first place, is that in the production of even the smallest electric light switch, the same attention is paid to detail and design, and the same finish is secured, as in the manufacture of the heaviest types of electrical machinery, in which sphere the British products are widely admitted to be the best in the world.

Then it must be remembered that the voltages in the foreign country often differ from those in Great Britain, as do the measurement standards of the electrical apparatus, with the result that the type of apparatus used in those countries is not suitable for the British market. The imported article has, therefore, in the majority of cases, been specially made for sale in this country. The cost of manufacture of such an article of which the production is comparatively small must therefore be higher than the cost of a similar article produced under mass production, which is made for sale in the foreign country itself. In order that it can be exported to this country, however, it must be sold at competitive prices, so that the quality of the exported article is generally below the quality of the similar product which is sold at home. In other words, we do not buy from other countries as good an article as they use

themselves. In addition to this, it is only by constant experience in the use and manufacture of a product that improvements in the product can be brought about, so that a special line of manufacture, as is represented by the imported foreign electrical apparatus, cannot have behind it the years of experience which either the foreign product for the foreign market, or the British product for the British market, has.

The British electrical manufacturers have for many years been making the entire range of electrical apparatus which their foreign competitors are producing and selling in this country. They have, however, been severely handicapped by the unwillingness on the part of the people in this country to develop the use of electricity in their homes. Its use in this sphere is still regarded as a foreign importation for which foreign apparatus must be bought.

It cannot be urged too insistently that the domestic use of electricity is no longer a new experiment, but that it is a permanent factor in the economy of the country as a whole. To illustrate this it is only necessary to realise how the average price charged per unit of electricity has fallen in this country over the last ten years. In 1920-21, the average price per unit for lighting and domestic purposes was 6d.; to-day the average price is about 2.75d. For power the average price charged per unit in 1920-21 was 2d., while now it is about 0.83d. In both cases, therefore, the price per unit has fallen to less than a half in ten years. During the next ten years, when the co-ordination of the electricity supply system in this country becomes effective, this price will be lower still.

What is just as interesting as the decrease in electricity tariffs is the fact that although both in Germany and the United States, where the domestic use of electricty has proceeded much further than in this country, the charges for current are higher, both for lighting and power purposes. The average price per unit for lighting and domestic purposes in the United States is at present about 2.9d.; in Germany it is 4.5d. Similarly the average price per unit for power is .9d. in the United States and 2.5d. in Germany. It is not, therefore, the difficulty of cost which is preventing the country from reaching the same degree of electrification as that which has been reached in the United States and Germany, as is very often supposed.

One final point may be mentioned. It has long been realised that one of the best ways to help the consumer of electricity is to offer him the means of buying his apparatus on a deferred payment basis. Many undertakings are willing to do this, but it is obviously necessary for their successful operation that they can be sure of a reasonable turnover. This can never be guaranteed if consumers in this country continue to buy their electrical apparatus from abroad. By buying their apparatus in this country, therefore, the consumers will be able to obtain it on increasingly favourable terms.

A British buyer naturally prefers to buy a British-made article whenever he can. It is hoped that the considerations which have just been set forth will go further in convincing him that, in buying his electrical apparatus in future, British is the best.

Electricity in the Home. By Herbert H. Berry, M.I.E.E.

I AM pleased to accept once more your kind invitation to come into the open and review the domestic electric situation in the home. I have refreshed my memory by turning up a few past records, going back ten years to April, 1921.

I find that about that date, I took what appears in retrospect to have been rather a bold step, when I suggested that the all-electric home could be widely adopted at the then rather high prices for electric current, and that electric cooking and heating could be more economical than either coal or gas. At that time it will be remembered we were in the midst of a depression caused by a world-wide deflation of currency, and we had not recovered from the aftermath of the Great War. Building schemes had hardly started.

Mr. Herbert H. Berry's most prominent electrical interests are the "Magicoal" fire and other heating and cooking products of Berry's Electric, Ltd. He has devoted special study to electrical warming installations for private houses and flats.

The scheme I then proposed for the electrification of the home was one which met with a good deal of criticism, because it favoured a combination of British and American methods. I had recently returned from a tour in North America. The Ideal Home, as I viewed it then, needed the little luxuries and comforts, and last but not least, the atmosphere of the Englishman's proverbial castle, great or small, and at a cost within his means.

The system which I then foreshadowed—the "Colec" system, often referred to as the "Co-Electric" system—allowed for the provision in the home of a source of heat energy provided by the direct burning, in or near the home, of raw fuel which might be hard coal, coke, or oil. The heat units required would be so much less than the total heat units required for a complete system using raw fuel, that the saving would be sufficient to pay for the electric current needed to make what is in effect an all-electric home.

I did not at that time visualise the extraordinary trend of building development in London, the erection of tens of thousands of flats, and the conversion of other tens of thousands of homes into flats. It is, however, I think, true to say that these blocks of flats, with very few exceptions, have been built entirely upon the "Co-Electric" plan, and the majority of converted residences have followed this plan.

I find the correspondence of some of my critics very interesting. In it I see the "Co-Electric" system described as a "domestic makeshift," a "halfway house," with other equally trenchant comments. On the other hand, the development of the "Co-Electric" system was very rapid, it was favourably referred to in a report by the Electricity Commissioners as far back as 1926. That ninety per cent. of the all-electric homes that have been created within the last ten years have been upon the "Co-Electric" plan is a conservative estimate.

I dismiss all these kindly critics with a flourish of my pen; for "the proof of the pudding is in the eating." I do not for a moment accept the suggestion that because the home has part of its heat energy provided by burning a little fuel locally instead of in the generating station, it is any the less an all-electric home. It is simply a question of expediency; and on that ground, in nine cases out of ten, the "Co-Electric" system under present conditions offers the economic solution.

In a paper before the I.M.E.A. in 1927, at Buxton, I stated the circumstances in which the all-electric home was a feasible proposal. Those statements have never been challenged. It is not my intention to refer here to the technical data published at that time; but I may say that I have unsolicited letters from engineers who attended that Conference, saying that they have installed the "Co-Electric" system in their own homes with success, and that, by a record of their costs, they have proved the correctness of my facts and figures.

Something is to be gained in this brief review of the past ten years' domestic electrification by drawing the attention of all who are interested in progress to the advantages that can accrue to them and to the public in general, by a wide view of this interesting problem. Except for the smaller type of home, it is reasonable to say that electricity would need to be supplied for heating at about five units a penny to be commercially competitive with the "Co-Electric" system. As I write, such figures are being quoted in the public Press, but it may be some time before they are realised. Meanwhile, we have a very alluring alternative, which enables every form of electric domestic labour-saving appliance to be used without fear of reaction.

There is now a rapid development of water heating by electricity in the home. Tens of thousands of homes, particularly in the Provinces and rural districts, built many years ago, are at present provided with room- and water-heating apparatus other than electric. More often than not such homes are not the property of the householder. Now without modern equipment, they offer an immense field for the addition of auxiliary electrical apparatus of all kinds; and domestic electric water heating in particular is at this moment receiving conspicuous attention. Where low-priced current is available, electric water heating in one or other of its applications offers many advantages. It finds favour with many supply engineers, on account of its satisfactory load factor; and some supply authorities are giving excellent service to blocks of flats, where the water supply is heated entirely electrically.

What we all have to bear in mind is that there is hardly a domestic problem where a supply of electricity is available, which cannot be solved to provide the All-electric Home Beautiful at a reasonable and competitive cost.

Why not hold Conventions Abroad?

Mr. Leonard L. Robinson, Borough Electrical Engineer of Hackney, has followed there for many years an active progressive policy—cheap supply, ready service, generous street lighting; and the extensions now in hand will give his power station a big place in the Southern area. Here, by way of advocating the holding of Conventions overseas, he describes what might be seen were the meeting in Holland

DO we make the best of the opportunities the annual Convention of the I.M.E.A. affords?

Ever since the initiation of the I.M.E.A. our Conventions have been in this country. In the early days industrial districts were chosen, and the meetings were of great value to the profession, owing to the character of the papers and the important works visited. We still have good papers, but the number who attend the Conventions compel the selection of large watering places, where alone there is sufficient hotel accommodation.

The result seriously restricts the value of the Convention. We have the papers and an excellent exhibition together with a huge social gathering of doubtful commercial value. We have no opportunity to see what our colleagues abroad are doing, or to discuss with them affairs of mutual interest. Yet they do many things so differently that such discussions would be mutually beneficial.

There are many great cities across the Channel, less than four and twenty hours from London, where we should have an enthusiastic welcome, where papers could be read by our own and by Continental engineers, and where we could inspect the practical work they are doing.

Leonard L. Robinson, M.Inst.C.E., M.I.E.E., M.I.Mech.E. (*Photograph by Elliott & Fry, Ltd.*)

What Dutch Engineers could show us

Holland is one of the countries which I have in mind. It is very easy to visit, and is full of interest, especially to municipal electrical engineers. I take it as an example, as I have visited it several times, cruising along its wonderful rivers and canals in a sailing or motor yacht, which, when time permits, is the best way to see Holland.

I do not think the Dutch engineers can show us anything strikingly new in generation or distribution, but there is much that is interesting and different. They could tell us a deal about propaganda, and about tariffs which induce a large proportion of the population to use electricity for many purposes. We, on the other hand, could tell them about hire purchase, free wiring, &c. They are suffering, as we did ten years ago, from the hostility of their electrical contractors.

The electricity supply industry in Holland is not so highly organised as is ours since the Act of 1926; but uniformity in the generating system and consumers' pressure has been achieved by agreement between the technicians without the business having become top-heavy with expensive overhead controlling bodies such as we have found necessary.

There is very little, if any, private enterprise in the electricity supply industry. The country is divided into eleven more or less self-governed provinces. These are North Holland, South Holland, Zeeland, Utrecht, Gelderland, Overizsel, Drente, Friesland, Groningen, North Bravant, and Limburg.

The industries are mainly agricultural; but in a country, which to a large extent lives by its water transport, there are, of course, extensive ship-building and engineering works. There is also a large brick and tile industry. There are the magnificent electrical works of the Philips Lamp Co., and in Limburg there are the Government coal mines.

Railway Electrification

Railway electrification is proceeding steadily. The track from Rotterdam to Amsterdam is a fine example, and this has recently been extended north to Alkmaar. The electricity supply for this State railway comes from the municipal and provincial undertakers.

Electricity is provided by the municipalities of all the important towns in South Holland. Amsterdam and Haarlem in North Holland have their own municipal supplies, which, owing to propaganda and clever tariffs have greatly progressed. These together give bulk supplies to the provincial undertaking of North Holland, and to part of the railway electrification. The province of North Holland is erecting, and will shortly open, a new station at Velsen, where two 33,000-kW Parsons turbines have been installed, the station being designed for an ultimate capacity of five such sets. This station will use coal in stokers with waste gas from a neighbouring iron works.

Dutch engineers hold that a station of about 100,000 kW is the largest that is desirable. On account of the water transport, the coal costs very much the same anywhere, condensing water is available everywhere, and it is thought better to have instead of a small number of very large stations a number of reasonably large ones, so that the cost of transmission may be reduced. There is a reasonable amount of linking up by agreement for mutual assistance; but nothing in the nature of a national grid or national control appears to be contemplated seriously.

The Tariff in Holland

While Amsterdam and Haarlem operate under the municipalities, the rest of the supply over the whole province of North Holland is under provincial control—largely with direct supply to the consumer by the provincial authority, but in a few cases by the local authorities who take a bulk supply from the provincial undertaking. The policy of the provincial undertakings is to supply everybody, no matter how remotely situated, at a uniform price, based on what may be called a 3-part tariff. This consists of a rent based on the size of the house (which compares very favourably with similar rents in this country) a unit rate of 1d. except for night current, that is to say, from 11 p.m. to 7 a.m., when the unit rate is only ½d. For certain purposes such as horticulture, &c., only ½d. per unit is charged, with no addition to the rent.

In the case of municipalities, profits are sought to a certain extent and applied to rate relief; but with provincial supplies, it is realised that electricity is so important a public service for the development of national interests that profits are not allowed, and are returned into the undertakings or used for the reduction of prices.

In farming, electricity is used for milking, sheep shearing, &c., for preparing the grain and roots, running saws, grindstones, pumps and hoists, for boiling pig foods, for water heating, washing, cooking and domestic services. In poultry breeding it is used for incubators, foster-mothers and egg testing. Market gardeners use it for warming insulated resistance wires laid under the surface of the soil, automatically controlled so as to keep the soil at correct temperature for growing such vegetables and fruits as melons, cucumbers, lettuces, strawberries, ready for a very early market. This is said to be very successful and profitable. In grape houses this insulated resistance wiring is hung below the vines and thermostatically controlled so as to be switched on immediately and save the vines from destruction in the event of unexpected frosts.

Electricity in the Auction Room

At the Alsmeer Flower Auction Market there is a novel application, small but interesting because it is labour-saving and time-saving. The buyers sit in raised seats very like those of a lecture theatre. Opposite is a dial with a scale of prices round the circumference and numbers corresponding to the seats inside the price scale. The lots are brought in under the dial, and the auctioneer, by remote control, swings the pointer to a high reading. The pointer then returns slowly towards zero and as it passes the price which the most daring buyer considers unsafe to pass he presses the button on his desk: stopping the pointer at the price and illuminating the buyer's number, so that the auctioneer can note the buyer and the price bid. The whole business is extraordinarily quiet, swift, and efficient. Thousands of bunches of flowers are plucked about 7 a.m., are sold by 10 a.m., and reach the markets in Paris, London, &c., about 12.30 p.m.

Most of the domestic apparatus is of German manufacture and of very poor quality compared with the same articles of British manufacture, but an exception to this is the apparatus of Inventum (a Dutch firm), which is excellent and consists

generally of water heaters and radiators, but no full cookers as we know them. I have not seen a really satisfactory cooking equipment in Holland, although every farm which has a supply cooks by electricity as a matter of course. The photograph (reproduced below) was taken in the electric kitchen of a Dutch farm house.

The Germans have all their own way in the showrooms; British propaganda and salesmanship are conspicuous by their absence. The Dutch want better apparatus, but have never heard of ours.

Polder Pumping

One of the most interesting uses of electricity in Holland is polder pumping. A large area of Holland is below sea level, and is only kept above water by more or less continuous pumping from one level to another until the water reaches canals communicating with the sea. This pumping not only keeps the land above water, but by its regulation keeps the water just at the right level below the surface of the land to give the best humidity for agriculture and horticulture. The waste water washes out the canals and keeps them clean. I am afraid a good deal of drainage goes into the canals; but I have never found them offensive except near large towns and in dead ends. The illustration (on page 1045) shows one of these electrical polder pumping stations.

Holland, as everybody knows, was famous for its windmills, which did this pumping. Now they are vanishing so fast that an association has been formed to preserve some of these ancient landmarks. I wonder whether in time to come we shall have an association formed in England for the preservation of our ancient pylons?

Windmills were first used about A.D. 1400. Now their day is definitely over. Each provides 10 to 15 h.p. in a fair breeze, but they cost far too much in repairs and maintenance, besides being useless in calm weather. Electricity is supplied for pumping at 1d. per unit; but the off-peak load, which the Dutch call "night current," is only ½d. So electricity is rapidly supplanting all the old windmills. Crude oil engines are its only serious competitors; but crude oil engines need more attention, are not so easily made automatic in action, and require heavy foundations. In Holland foundations are a serious problem, as each has to be on piles.

Would it not be a good idea to have our next convention abroad, and take our convention exhibition with us? Thus, we could expand our own knowledge, and further the interests of the British electrical engineering industry. I hope that this will be seriously considered by the Council of the I.M.E.A.; and that it will result in holding the Convention, at least every other year, outside this country.

Off-peak Prices. By D. J. Bolton

What proportion of the fixed charges should be borne by night loads?

EVERY electricity undertaking must make it its business to explore every avenue for the disposal of the energy it has to sell. The question which arises in each case is—At what figure will any particular addition of load be profitable?

The types of load I propose to consider here lie entirely outside the peak period of the station or supply system, usually extending throughout the night. Such loads include the various types of thermal-storage heating system, night baking, and certain time-switch controlled heating installations.

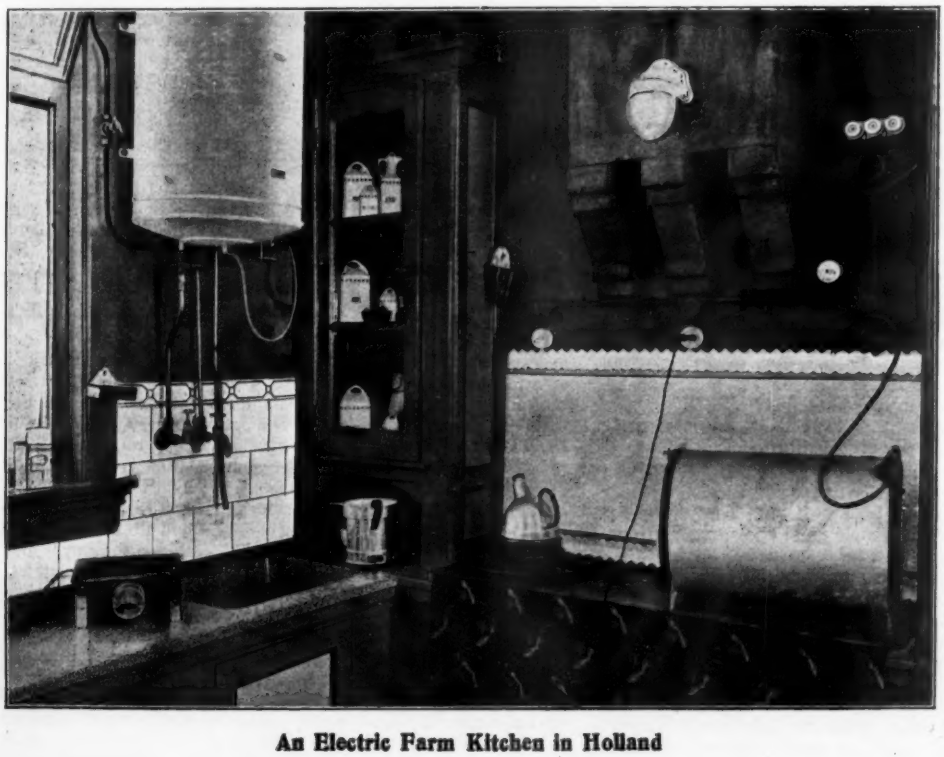
There is at the present moment a marked activity in connection with schemes of this sort. Several Institution papers have dealt partly or entirely with them, and in a recent case the attendance and discussion were quite exceptionally large. Super-hotels, super-cinemas and theatres, super-offices and flats continue to be built and to vie with each other in their up-to-date equipment in spite of trade depressions. Architects and others are taking another look at the economic and artistic possibilities of large-scale electric heating. When any such plans are being got out it is essential for the supply engineer to be prepared with *his* plan, or at least to have some idea as to the figure at which the new load can be entertained.

The Two-Part Tariff Inappropriate

It is no use charging for off-peak energy on the basis of an existing multi-part tariff designed for the ordinary day load. This is neither equitable nor in the least likely to gain business. The normal two-part power tariff is designed for each consumer to pay his share of the fixed costs, based on his particular load factor and assuming a certain average diversity from other consumers. But the night-load consumer entails little or no fixed cost, and on the other hand his load factor is probably no better than that of the average day user.

Take the case of a 1,000-kW thermal-storage system which is connected at 8 p.m. every evening and disconnected at 8 a.m., and which has a mean load during connection of 600 kW. Even though its use coincides exactly with the maximum demand charging periods, the mean load factor during these periods will be only 30 per cent. Assuming that the normal tariff for this district and type of supply is £4 per annum per kW, plus 0.2d. per kWh, such a consumer would then have to pay an overall figure of 0.57d. per kWh, which would usually make such a scheme impossible. In fact, not only would the normal figures be unsuitable, but any form of dual metering and tariff would probably not meet the case for this type of load so well as a simple over-all quotation.

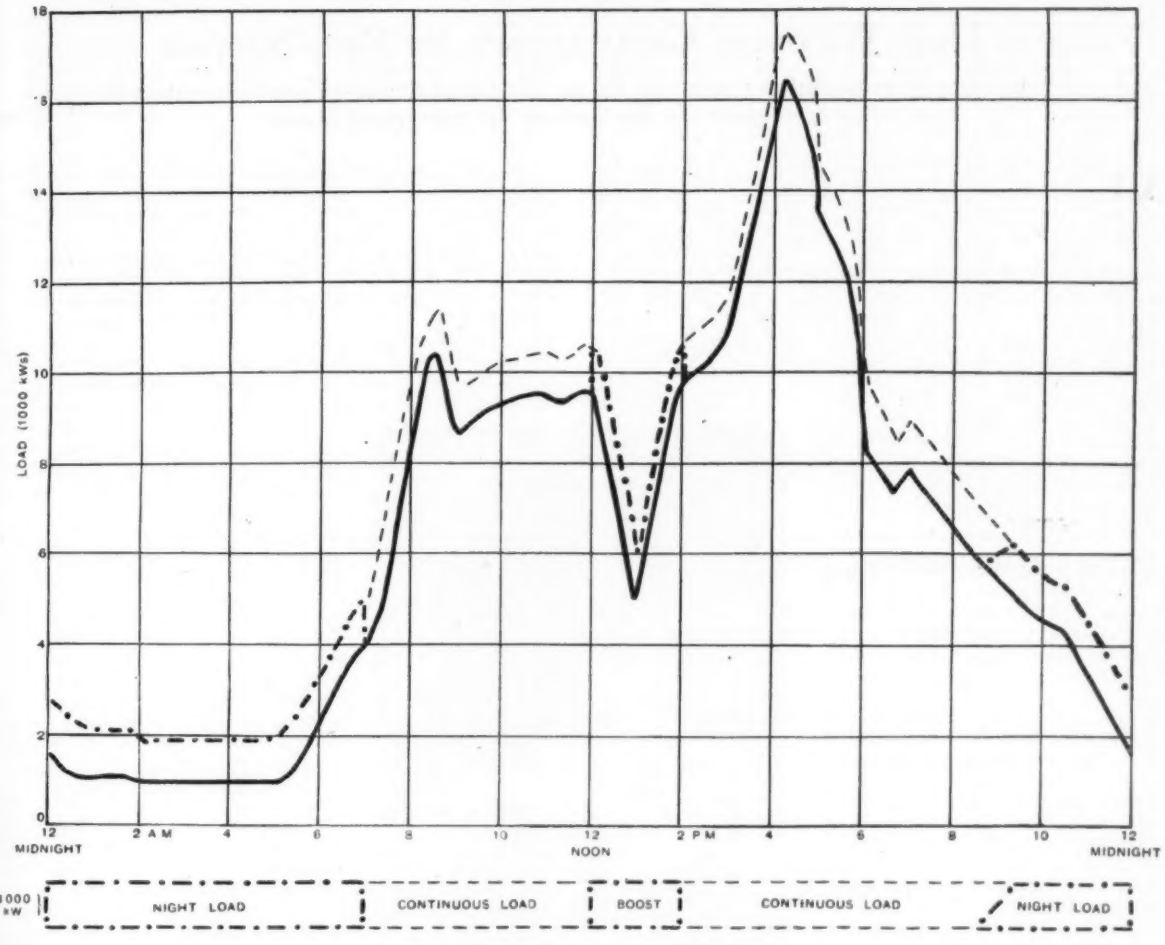
The merit of the two-part tariff figures is that they will provide the necessary data on which the single price can be based.



An Electric Farm Kitchen in Holland

The 100 per cent. Load Factor Charge

Let us suppose such a consumer to pay the same as one with the same energy consumption and with a 100 per cent. load factor. This is clearly more feasible; and it would reduce the price in the above-mentioned case to a figure of 0.31d. per



kWh; but it does not quite meet the case, since such a price will usually still be too high to make large-scale heating economical. Moreover, it remains unfair to the off-peak user.

This may be well seen by taking a typical winter's day load curve, such as that indicated by the full line in the accompanying figure. Below the zero line is shown, in the form of chain dotted rectangles, the imaginary load curve of a thermal-storage system working at full load (1,000 kW) for ten hours each night, with a two-hours' boost at mid-day. (The evening load is switched on gradually, as indicated by the inclined line.) The influence of this on the original load curve will be to raise it at the points shown by the chain dotted additions, the remainder following the full curve as before. This effect may be compared with that of a 100 per cent. load-factor consumption having the same maximum power, such as is represented by the faint dotted rectangle (below). Its effect on the original load curve is, of course, to push it up by this amount throughout, as shown by the faint dotted line above.

Taking only the fixed charges in these two hypothetical cases, and neglecting for the moment the different consumptions, it will be evident that the 100 per cent. load-factor consumer puts the supply authority to a much greater fixed cost than does the night-load consumer having the same demand. The 100 per cent. load-factor consumer, since he overlaps the peak period, entails a definite increase of 1,000 kW in the generating and transmitting plant, whereas the night load consumer can fairly be said to involve no fixed expenses at all. In fact, he does not necessitate a single extra kW of plant throughout the whole system.

Off-peak Charges

Logically, it might be held to be fair to omit the fixed charge entirely in the case of a customer whose consumption cannot possibly overlap the period of maximum demand on the system or on any part of it. Thus, if the normal tariff were the one just quoted, he would be charged merely the running price of 0.2d. per kWh. But this, which is virtually selling the additional kWh at the bare costs of generating, would be going too far in the other direction.

In the first place, it is not right for any additional business to be done without some sort of contribution to management and other fixed expenses, since all business involves some degree of clerical and staff work. In the second, it is bad policy to accept business at a price which cannot be maintained indefinitely to future consumers.

Here is a suggestion for a possible tariff basis. I admit that it is tentative, and that it may seem to justify the stern remarks on empiricism made in the Institution Presidential address. We have seen that a fixed charge based on the assumption of a 100 per cent. load factor is too high, while to omit the fixed charge entirely gives too low a figure. The suggestion which I have to make is to levy a fixed charge of *one-half* that which would be paid by a 100 per cent. load-factor consumer having the same demand. This would make possible a competitive quotation in many cases of night heating. For example, in the instance just given, the charge would be 0.255d. per kWh in the above instances. This would mean that the off-peak load was at all times paying its way, and at the same time was making a small but useful contribution to the interest on capital and the management expenses.

In the case of the tariff already assumed, namely, £4 per annum per kW, plus 0.2d. per kWh, the following table gives the results of the various methods of charging which I have outlined.

Assumption.	Fixed Charge reckoned as a price per kWh.	Total Overall Charge per kWh (adding 0.2d.).
30% load factor ...	0.37d. ...	0.57d.
100% load factor ...	0.11d. ...	0.31d.
Fixed charge half the above ...	0.055d. ...	0.255d.
No fixed charge ...	— ...	0.20d.

Tariff Proportions

However lenient the method adopted for assessing the fixed charge for off-peak loads, there is still a danger of the price being swamped by the running charge if this is a high one. This turns on the important question of the *ratio* existing between the two parts of the normal tariff. Too often this ratio appears to be a matter of accident rather than design. It may be argued that the proof of the pudding is in the eating; that the justification of a tariff is that it brings in the consumers on the one hand and the money on the other. If total receipts balance total expenses with an adequate margin, what matter if the proportions of the receipts are not what they should be? Whatever justification there may be for this contention in the case of the normal consumer, it is quite fallacious when dealing with special cases. In fixing the tariff for a night load, it is of the utmost importance that the basic data from which the tariff is calculated shall be sound and correctly proportioned.

The Woman Canvasser. By Vera Norvick

Showing how useful women can be in electrical development now that it lies so largely on the line of the electrical home

ONE of the most encouraging features about electrical development in this country to-day is the fact that the everyday man and the everyday woman too are alike ready for it. "Oh yes, electricity is bound to come and very soon too!" is often overheard. The electrical idea has travelled far from the plane of the scientist and inventor. It has reached the level of everyday life. That ideal—the all-electric home—is old enough to the enthusiast, but only in the last few years has the man-in-the-street come to think about it. To-day he begins to realise that electricity is not only a luxurious adjunct to leisure but is itself a maker of leisure. The general acceptance of this electrical idea helps towards its practical realisation: its psychological value is great. It is our task at this stage to translate the thought into the deed—to crystallise this acceptance into a definite determination to use electrical power.

Women Valuable Publicity Agents

The interest women are taking in the electric home denotes the trend of future electrical development, and it is here that the services of women will be specially useful. They have done much good work already, as cookery demonstrators and showroom assistants, but canvassing is a field in which they have as yet played only a small part. It could be an important one. The canvasser's talks and demonstrations, even if they result in no immediate sale, often lead eventually to business, so that they are acting all the time as publicity agents, and as such should have a real value to the industry.

According to the dictionary, To Canvass means: "To examine; to sift; to solicit orders." These may be regarded as three distinct stages of development; and all three in succession apply to canvassing for increased use of power and light. For, first, the district to be canvassed must be examined and explored. Local conditions must be ascertained, including the sources of livelihood of the people, and their standard of living. Then the information so collected must be sifted; and by so doing, the ground is prepared for the third stage, that of soliciting for orders.

Miss Vera Norvick has for some years watched the domestic electrical movement from close quarters, and holds an important post with the Electrical Association for Women. She was formerly a member of the D'Oyly Carte Opera Company, and took part in the play "Watts in a Home" recently produced by the E.A.W. (*Photograph by Vaughan & Freeman.*)

The canvasser working for an electricity supply undertaking is most often engaged in getting new consumers. Householders living in roads where mains are soon to be laid are talked to of the advantages of electricity, and encouraged to avail themselves of the power soon to be brought to their doors. The canvasser acts as a liaison between the prospective consumer and the supply undertaking. In view of the lasting effects of a first impression, the canvasser's part is an important one. During the first interview the canvasser should not only talk of the advantages of electricity, but should be able to quote the approximate cost of taking the service into the house (if this is not defrayed entirely by the undertaking), and suggest the probable position of the service and meter. Particulars of any assisted wiring schemes and hiring schemes may be put forward, or, alternatively, advice given as to reliable contractors. A thorough knowledge of the charges prevailing in the particular locality is clearly necessary.

The Appeal to the Housewife

In many districts this initial work has not yet been entrusted to women, but several instances can be quoted where women have done it very successfully. In villages especially they have been accorded a sympathetic hearing after men had failed to obtain one, simply because they were women, and the housewife felt that her point of view would be better appreciated, and her scant knowledge of electricity more sympathetically regarded, by a member of her own sex.

The successful canvasser must have a knowledge of the simple economics of electricity. She should be able to answer in simple language many of the questions which women ask: On what are the charges for electricity based?—Why should one customer have to pay so much more for current than a friend living in a neighbouring town?—Why does electricity cost so much more for lighting than for heating and cooking?—Why can a friend living in a certain town get electricity for water heating at a specially low rate? These and similar enquiries are constantly being made by the housewife. The woman who can answer them satisfactorily and who has a knowledge of local conditions, together with human understanding and sympathy, can do a great deal towards furthering electrical development.

After the woman of the house is satisfied about the cost of installation and of current, she wants to know what are the best appliances, how much they will cost to get and to run, and how best to use them. A practical knowledge of the appliances themselves, allied to some experience of home management without electricity, will do much to increase the confidence of the housewife in any claims made. The selection of electric fires and of an electric cooker, the points of advantage about, say, an electric iron are things which a woman with practical experience can point out and can give valuable help and advice. More and more women are taking an interest in illumination. They are not always content to leave the placing of the lighting points to the architect or the builder or contractor. Here again the personal interest of the woman adviser may be called upon.

When the housewife has decided to have electricity installed in her home, it is an advantage if the canvasser who made the first contact can see the job through. It is hardly likely to be convenient for her to handle every stage in the transaction; but it might be arranged for her to receive the customer in the showroom or office, and introduce her to the various departments. The woman customer does not like to be handed on from one person to another, having to repeat her story to each. A good start may often be spoiled in this way; whereas, if the woman who first interested her in electricity can receive her in the showroom and pilot her through, she feels that there is someone she knows on whom she might call for help or advice.

The woman acting as showroom assistant or as cookery demonstrator is limited to that particular field of activity; but in spite of this limitation a demonstrator who visits the consumer in her own home has many opportunities to introduce a wider use of electricity and so practically acts as a general canvasser for her company. She can mention the usefulness of various small appliances, and broach the questions of cleaning, heating, improved lighting, and also water-heating, upon which the smooth running of the home so largely depends. A capable woman given full scope in this direction can be very profitable to her company and most helpful to the housewife.

The Industry can Learn through Her

Visiting the consumer in her own home from time to time, she can get to understand not only the consumer herself, but the arrangements of her household, her financial circumstances and her tastes, and, therefore, be in a much better position to advise on additional electrical service than the assistant who can only guess at a customer's requirements during a short interview in the showroom. Through her, also, the industry can learn what it is the woman in the home wants, and can get practical criticisms and suggestions.

Very little encouragement is required to induce women who have already experienced some of the advantages of electricity to install additional "outlets," or to purchase further appliances. The decorative value of electricity may be introduced. the charm of coloured lamps may be emphasised, while the demonstrator can advise the correct wattage of lamps for different rooms, so as to avoid waste while ensuring adequate light

In country districts the growth of interest in electricity is specially significant; more and more lectures and demonstra

tions are being given at women's institutes, village halls, &c. A cookery demonstrator whose work consists almost entirely of development in a large rural area, does all the preliminary negotiations herself. She calls on the president and secretary of the local women's institute and if her offer of a lecture-demonstration is accepted, makes the necessary arrangements. A cooker is wired up and connected by her company in the institute or village hall. At the end of the demonstration, questions are asked and answered and the names and addresses of those who would like further particulars are taken. Many new consumers have been obtained through a good practical cookery demonstration. It may be said that this is not canvassing, but it should be first-class propaganda.

Inquiries for new installations are generally dealt with by the local engineer or out-door representative, cooker inquiries only being handed over to the demonstrator. As she has been responsible for some of these inquiries through the goodwill created by her lectures and demonstrations, would it not be possible to allow her to interview the prospective consumers once again, and personally to introduce the representative who would deal with the technical questions, thus fostering the friendly feeling between housewife and supply undertaking?

A Rural Outlook Needed

The woman whose work lies in rural areas needs to be acquainted with facts which would not of necessity come within the range of her town colleague. She may be asked questions about the overhead lines, and wayleaves and the grid are frequent topics. To deal with these intelligently she must possess some information about the conditions prevailing locally. Many believe that the future of our agriculture depends largely upon a cheap and plentiful supply of electrical power; and while electric farming may be beyond her ken, the rural canvasser should be able to give helpful advice to the farmer's womenfolk, who are anxious to know how electricity may be used to advantage in the dairy and the poultry run, two spheres in farming with which they are immediately concerned.

In the towns there is great scope for the women who are helping forward the cause of electrical development. Many women's organisations would be glad to have lectures and demonstrations dealing with a subject of such wide-spread interest as electricity, especially if they were given from the angle which would appeal to the particular organisation. As a means of eliminating drudgery in the home, electricity leads the way, and one of its most valuable lieutenants is the woman working in the industry.

Given a training which includes an understanding of household problems, possessing sympathy and an appreciation of the other woman's point of view, having the initiative to size up a situation and to grasp the opportune moment to talk electricity, gifted with a sense of humour and tact, crowned with keeness and enthusiasm, this woman can help us greatly along the road of electrical development.

Dealing with the Consumer. By P. Ward

Trials and pleasures of a sales engineer in contact with the customers of the supply undertaking: the requirements of the ideal member of a sales department staff

SALES departments in electricity supply undertakings have not always been regarded favourably. When first suggested, the managements were apt to be doubtful of the need for them, and to incline to the view that the engineer's duty was not to create a demand for energy, but to meet the demand when it came. The contracting branch of the industry also felt that a sales department might operate to its disadvantage. It has now, however, been shown abundantly that where there is an efficient sales organisation there is an increased output demanded of the undertaking, an increased sale of apparatus by the manufacturers, and an increased amount of installation work for the contractors, who share in the increased sale of appliances.

Mr. Ward is the engineer who, under Mr. W. F. T. Pinkney, is responsible for the development of the heating and cooking load of the Newcastle-upon-Tyne Electric Supply Co., a position he has held for about 12 years. (*Photograph by Ed. G. Brewis, Ltd.*)

Not so long ago the commercial engineers were regarded by the rest of the staff of any undertaking as sitting in comfortable chairs with manufacturers' catalogues on one hand and a box of cigarettes at the other, waiting patiently for inquiries to come in. That phase, too, has gone by. Up-to-date concerns now plan to work from the consumer inwards, and not from the generating station outwards. Whereas the sales department used to be told what it could have, it is now being asked what it wants.

Since its members are the link between the undertaking and the customers who are to provide its revenue, the *personnel* is an important consideration. Preferably the sales manager should be an engineer. Men with selling ability, but without technical experience, may have been necessary as a temporary measure, and have been fairly successful; but they cannot talk to the consumer with the confidence that comes from knowledge, and do not therefore inspire that reciprocal confidence which helps business.

The qualities of the ideal sales engineer are a good general education, a grounding in science, practical engineering experience, a pleasant personality, with tact, and a knowledge of human nature, tenacity, and the power to express himself simply. For an executive position he must have a knowledge of the Acts which affect the supply industry, at least a nodding acquaintance with law and accountancy, organising ability, negotiating skill and a little of the art of public speaking. We cannot expect to find all these attributes under one hat; but a combination of them in the various members of a staff is not impossible, and is indeed essential.

The life of a sales engineer takes some beating in the matter of variety. Standing, as he often has to do, between the consumer and the undertaking, or some other department of the undertaking, or between the consumer and the contractor, he may be shot at from both sides. He has his worries; but he also has opportunities of finding some fun.

One of his side lines is the handling of disgruntled consumers; they may not be many, but a few of them can be a thorn in the flesh. Every grumble, justifiable or otherwise, is an opportunity for personal contact which should not be neglected. If the complaint is genuine and is remedied, the grumbler becomes a friend who will accept suggestions; even if it is not genuine, the contact may prove ultimately of service.

Some Disgruntled Consumers

One I had not met before recently came to me in high dudgeon: he told me just what he thought of myself, of the undertaking, and of everyone connected with electricity. It appeared that he had received a "final notice" for his account, which, he said, had only been in his hands for a few days. The suggestion that it must refer to some previous bill which he had not paid only made him worse. He never let his accounts get in arrear. His wife had talked of getting an electric cooker, but he would see us—somewhere else—first.

On sending for his "history card," he was shown that his old account actually was not paid; and when he found it in his pocket, his face was worth a frame. He did not know what to do or say. At this stage I started talking of cookers, and in less than five minutes the account had been paid, and the form signed for the hire of one which his wife was to come and select the next day.

Another consumer was indignant because he had had "an account for something." Actually it was a credit note; and after pointing out that he was thirty shillings better off than he thought, he came into the showroom with me, and left it with—a kettle. It is surprising how many people do not know what a credit note is.

One of the reasons against frequent staff changes is the value of one who has come to know something of the tastes and hobbies of his clients. I had to deal with a man who thought his bill was bigger than it should have been. His meter cards showed that his consumption was regular; it was the fact that the account covered a longer period than usual that had misled him. A few days before I had seen him

driving a Baby Austin, and a casual remark about cars turned the conversation entirely. He told me all about it; how he took it out in place of an umbrella when it rained; if it needed washing he just held it under the tap. By that time we had reached the cashier's desk, and I mentioned the account. "Oh, well, old man, if you say its right, that's good enough for me," was his reply. He paid up, and a few weeks after came to ask about warming his garage.

The Consumer Always Right

It is wisest to act on the principle that the consumer is always right. Even when he is absurdly wrong, it is policy to let him feel that he might possibly have been right; he will be more ready to hear what you have to say, and to come round eventually.

One soon gets to sense the credibility of strangers. Those who protest most vehemently when asked for references are those who have most difficulty in furnishing satisfactory ones. When they tell you that if you insist, they will go to the gas company, where they will be treated with civility, you may be sure that they have already been there, and have been asked, not for references only, but for a deposit.

Then there are those who are going to write to Mr. Councillor So and So, or to one of your directors, "who is a personal friend of mine"; not so great a friend as to prevent them from mispronouncing his name, or in some other manner giving themselves away to a careful listener.

Difficult people to deal with are those who are frankly sceptical of everything you say. Before you can get very far with one of these, the reason for the scepticism must be found. It may be a natural habit, only to be overcome or worn down as best one can; it may be due to the reported experience of some friend at a distant place or time, of which they have only heard half the story.

Seeing's Believing

Ocular demonstrations are very valuable, and a properly-equipped and up-to-date showroom is an essential to a sales department. An apparently intelligent woman who really wanted to replace her gas wash-boiler by an electric one had heard somewhere that electricity was "slow," and that water boiled electrically was not as hot as when boiled by other means. Obviously, it was no use talking to her about "boiling point," or degrees Fahrenheit; but the sight of ebullient water soon convinced her.

The advantage of a practical training to a sales engineer is that without it he is not likely to be a judge of what is or is not practicable from a works point of view. It will prevent

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Mr. J. W. Thomas, LL.B., Barrister-at-Law, who writes in this issue of the "Electrical Review" on Electricity Supply Salaries (see p. 1044), was for nine years Assistant General Secretary of the Electrical Power Engineers' Association. He resigned this two years ago to practise at the Bar, joining the Northern Circuit. (*Photograph by Elliott & Fry, Ltd.*)

him from pushing the "consumer always right" to extremes, which may embroil him with other departments. If a consumer makes an unreasonable or impossible request, the sales engineer has to persuade him from it; or if that cannot be done, would have to consult the other department concerned unless the sales engineer is in a position to come to a decision on the spot on the strength of his own judgment.

The Small Consumer's Consultant

The sales engineer's primary duty, of course, is to sell energy. To this end he must devise ways and means to persuade consumers to install appliances and the circuits on which to use them. He must stand to the small consumer in much the same relation as that of the consultant to the large user. He must therefore be familiar with the latest in wiring systems and practice, must know what appliances can best be recommended to meet various needs, and what they will cost to install and to operate. It is not always necessary to talk cost, but one must be prepared for it. People have been persuaded by our competitors to think everything connected with electricity is dear. Many a potential consumer will tell you that he "cannot afford it," although he may not have the remotest idea of how much he is at present "affording" for alternative means.

The "Hired-wiring" Scheme

One of the most successful methods of increasing revenue in recent years has been the "hired-wiring" scheme for small domestic property. It has not only brought revenue to the undertakings, but many thousands of pounds of wiring work to contractors, and of lamps, appliances, and accessories to manufacturers. Some knowledge of accountancy and of legal matters is valuable to the sales engineer when floating such a scheme; since, although he may not be actually responsible for the legal and financial aspects, he must at least appreciate their effect when framing his terms of hire.

As an organisation develops, special members of the staff may have to be detailed to deal with various applications, such as heating and cooking, refrigeration, water heating, and motive power requirements. All the members of the staff, however, should be capable of discussing such subjects intelligently up to the point at which the consumer becomes sufficiently interested to be handed over to the specialist as a likely customer.

Thus it will be seen that the planning of a sales organisation calls for a broad outlook, but with this must go attention to detail if the organisation is to function smoothly. For it is in small matters as a rule that the ordinary consumer is either pleased or displeased; and forethought in smoothing out all possible sources of friction is trouble well repaid.

Watt-Hour Meters. By E. Fawssett, M.I.E.E.

Comparing the latest induction watt-hour meters with those of a few years ago, while there is no outstanding change to record, there has been distinct progress in detail and in performance

Mr. Fawssett is Chairman of the Meter and Instrument Section of the Institution, and an active member of several committees of the British Engineering Standards Association and the Electrical Research Association. Many developments in electrical measurement are due to him. He is on the staff of the Newcastle-upon-Tyne Electric Supply Co., as testing engineer. (*Photograph by Elliott & Fry, Ltd.*)

FIGURES recently submitted suggest that, considered alone, the chrome-steel permanent magnet provides the cheapest brake. But it only does so, under modern requirements of torque and speed, by taking up a great deal of room; consequently other alloys requiring less mass of material have supplanted it. Two small magnets, fitting better into the available space and providing two baskets for one's eggs, have replaced one larger one in many designs.

Opinion is, however, very sharply divided between the relative merits on every ground of tungsten and cobalt-steel alloys, and I know of eminent meter manufacturing engineers in each camp who are very emphatic as to their choice. From the meter user's point of view the egg-basket argument appeals, yet the technical performance of cobalt steel is such that if the maker is prepared to supply the more expensive magnet the user certainly should not object, especially as egg shells are now less fragile than of yore.

A Retrograde Step

Whereas a few years ago most dial-trains were either definitely positioned in manufacture without possibility of alteration, or left to take up any setting the tester might choose: now good designs provide for an adjustable position which can be exactly recovered if the dial is taken off.

There has been, it seems to me, on the whole, from the user's point of view, rather a retrograde step in the clarity of the dial faces, as many of these have been reduced to the absolute minimum dimensions set out in the British Standard Specification, which are certainly small for ease of reading in awkward situations. There has been too great a craze for using the absolute minimum of material, and for crowding everything into the least possible space, making the smaller pattern of meter offered by several makers a very awkward customer to see into and not at all popular in the test-room, however much the outside staff may appreciate the reduction in weight and bulk. Of course, the position would be different if, in general, the smaller meter cost less, though even then I submit that in view of its long life, and, consequently, the very considerable revenue obtained through its registrations, it is easy to overstress the importance of exceptionally low first cost if that involves the slightest risk of deterioration in accuracy.

A little simple accountancy involving interest and depreciation (allowing in fairness a higher rate of depreciation on the cheap meter), set off against a possible loss of no more than a half of one per cent. on the average revenue it obtains, will show that a cheap meter, even if only a little nasty, can be a very bad investment. This does not mean, of course, that paying the top price ensures the best article.

Considering the various places in which the meter has to work—the coal cellar, under the scullery sink (more or less), high up on the kitchen wall, and elsewhere exposed to damp or dust—much more care ought to be taken than often has been the case, to make a thoroughly good joint between the cover and the box. One type now has a cork gasket which is very promising; another very definitely impregnates the usual cotton gasket with a dust-resisting medium. Practical experience suggests that, since so much of what trouble there is with a modern meter (once it goes out into service) is due to foreign matter that manages to get inside but should not, every cover joint should stand ordeal by water. No doubt this will be derided as too severe and a nuisance, but it is only necessary to compare the state of two meters that have been out in bad positions ten years (a good workable limit for this type), one of which could pass such a test, and the other could not, to see what a lifelong benefit a really good cover joint is.

It is almost unheard of for the shunt system to give any trouble nowadays: and the series element has been much improved where, in the larger sizes particularly, there really was need for improvement. The construction of the series copper winding on certain ultra-modern patterns to deal with 40 amperes and over, combining neatness and good insulation with an excellent connection to the terminal block, is worthy of high praise.

Pivot and Jewel Bearings

The top guide pin and the jewel in several different types are both instantly removable; and, most important of all, the main rotor pivot is detachable for microscopic examination or replacement. In most of the ordinary pivot and jewel bearings which are standard practice to-day, as for the last thirty years at least, a hard carbon-steel pivot, with an end shaped very much like the small end of a rather pointed egg, rotates in a cupped sapphire. Other arrangements are variants of the same principle in which a portion of a sphere of radius x rotates inside a portion of another sphere of radius y, where y is usually of the order of $4x$.

Since two spheres of different radius can only touch at a point and a point has no area, the stress due to the weight of the rotor would be infinite if something did not yield. A pivot and jewel shaped more or less as just described, do yield, usually within the elastic limit, so as to relieve the stress and reduce it to some such value as 50 tons per sq. in., being highest at the centre, while reduced to nothing at the edge of the area of contact. In any such design a stress involving yield of the material is absolutely unavoidable; and, in consequence, any flaw in either component causes rapid destruction of the bearing, and the friction may easily increase to 100 or more times its initial value in a day or two once trouble sets in.

Synthetic or Natural Stones

The balance of experience to date seems to favour synthetic stones as being more uniform than the average, if not as good as the best natural sapphire. Diamonds, too expensive for the ordinary house meter, seem the best solution for large energy meters, if they are aged in use, before finally testing and installing, to acquire a certain slight roughness which does not increase over a long period. But it would appear that the present meter bearing is inherently on the wrong lines, and a new design in which the vital working parts were never subject to stresses remotely approaching the elastic limit would surely reduce the present troubles, which certainly are costing the supply industry thousands of pounds annually in lost revenue.

The old idea of partial magnetic suspension of the rotor has been revived. This, no doubt, is a palliative; but so long as any weight whatever comes on the pivot in the usual design, that pivot is stressed to the elastic limit; the less weight on the pivot the less the area that is under stress and the less chance of failure, from a purely static load. An induction meter rotor is, however, a live load, subject in varying degrees to vibration transmitted through the disc and spindle to the pivot point; and in some designs this vibration is so severe as to damage the pivot and jewel very rapidly, permitting the pivot to skate over the broken surface with no little loss of accuracy. This is hardly an ideal state of things.

Carbon Steel

Complete magnetic suspension might be practicable (for large energy meters) if the exact height of the rotating discs in the electro-magnet gaps was not of supreme importance. By using a bell-shaped armature I could build such a meter without any jewel bearing at all, the rotor floating and guided at the bottom in a phosphor-bronze self-oiling bush; but no such elaborate arrangement is commercially possible in the domestic meter, the invention for which of a satisfactory design we are all awaiting with great interest. Researches in this country and large-scale practical experiments here and in America seem to show that with the present design of bearing a suitable carbon steel is better than "stainless" steel, or, in fact, any other likely alternative, but all of them when run dry tend to disintegrate, rust being formed due, it is thought, to molecular oxidisation under the intense pressure.

Several types of oil have been tried, but in general only stave off the evil day; in some cases the remedy is even worse

than the disease. The nearest approach to anything like satisfactory behaviour that I have found so far appears to be a fairly light and thoroughly stable mineral oil, such as high-class medicinal paraffin, which, left to itself, would soon creep out of the bearing, but can now be kept there by varnishing both pivot and jewel mount with "Epilame." We have less than a year's experience of this treatment as yet, so it is too early to say whether the promise of good behaviour is to be fulfilled. Certainly a mere smearing of a heavier oil of similar type does not prevent rust forming. All of which shows how unsatisfactory is the present design, and how great is the need for something vastly better.

Extended Range and Accuracy

The ordinary commercial single-phase meter can now be bought from more than one maker compensated for changes in air temperature over a wide range of power factor. This is a refinement that is really only necessary on loads of bad power factor, as owing to the inherent characteristics of the uncompensated meter making it run with rising temperature slightly faster at unity power factor and considerably slower at 0.5 lagging power factor, such a one is roughly correct at 0.8 power factor (lag) over a wide range of temperature. Only if the power factor is much below this is compensation worth while if it costs any money. For motor loads, especially single-phase, I think compensation distinctly worth while; as at 0.4 lag, corresponding to a motor lightly loaded, the temperature effect is very considerable.

Perhaps the most outstanding practical achievement of late years is the straightening of the accuracy curve, and the extension of the range of accurate performance which has been attained, partly by a reduction of speed and series ampere turns, combined with increase of brake torque, and partly also as the result of very careful design of the electromagnetic system generally, different makers using special devices of their own to this end. The old-time standard speed of 40 r.p.m. at full load has thus been reduced to from 20 to 30 r.p.m., and in one case much less, though this has been found to make low-load adjustment difficult and erratic.

A representative modern type would have a speed of 25 r.p.m. at normal full load, a torque thereat of 4 cm./gr. at least, and a shunt loss not over 1 watt at 50 cycles. Its range would extend as a matter of course and without finicky adjustment, after satisfactorily starting at 1/200 full load, from 1/20 to double load without exceeding 2 per cent. error at any point. This does not mean to say that the larger sizes of straight connected a.c. meters should be contemplated as good for double load *continuously* except under ideal conditions of installation; as, although the accuracy would be reasonably good, there is distinct risk in running an ordinary terminal—such as is provided for a 40-ampere meter to B.S. Specification—with a connection formed by two smallish screws clamping a "dry" stranded cable, unless it is itself a good fit in the hole at 80 amperes continuously. I have had far too much trouble with the external connections of the larger straight connected meters to contemplate it with entirely equanimity. Personally, I think a 40-ampere meter should be regarded as good for a 60-ampere continuous load, and for anything above that a current transformer should be used.

It is good to know that no ordinary voltage fluctuations affect the accuracy of the modern meter. Indeed, several types can be used indiscriminately on 100 V or 200 V if desired; though this is not really very sound practice, seeing that the operating torque is so much reduced at the lower voltage and could only be justified if it were inconvenient to hold stocks for both.

The Effect of Frequency Change

With the advent of the Grid supplies many will be changing over to 50 cycles from a frequency not so far removed that the meters are unusable. In this connection, the characteristics of the various well-known types as regards change of registration with change of frequency at unity power factor are of great interest. In a recent paper by Messrs. Moore and Slater before the Meter and Instrument Section of the Institution of Electrical Engineers, curves were given for a selection of types showing the optimum point—or highest relative speed with change of frequency for a given load—to vary from 45 to 60 cycles, and even the same meter with different thicknesses and materials for its disc could give optimum points from 40 to 100 cycles. Consequently, a meter calibrated for 40 or 60 cycles may be fast, correct, or slow at 50 cycles according to what part of the characteristic these frequencies lie on in its particular case.

Tests made on some sixteen commercial types in use at the present time show a remarkable divergence in registration characteristic, the change from 40 to 50 cycles ranging from nearly 4 per cent. slower to 2 per cent. faster, the majority being slower and one identical. As many tens of thousands of such meters are never used at anything but approximately unity power factor, it must be to the advantage of any supply undertaking operating within the range of frequency indicated to buy meters with the right characteristic; as then no change will be necessary when they are connected to the national grid. An average of good commercial meters shows a change of 9 per cent. faster from 40 to 50 cycles at 0.5 lag, and the best of them so far encountered gives a value of 6 per cent., corresponding to two electrical degrees; so that the latter would be only 2 per cent. fast, or within the limits, on a power factor of .866 lag. This is sufficiently good to tide one over the actual moment of change-over, and to enable one to change the low-power factor single-phase load meters more or less at leisure.

Thus we have improvement in every direction—except possibly in dial legibility. Although meters bought 10 or 15 years ago are far from worn out, they are actually obsolescent; yet it is difficult to see how the present-day product can become seriously obsolescent, unless someone comes along with the perfect lower bearing, and I can see no reason why it should not have a useful life of from 20 to 30 years.

Electricity Supply Salaries. By J. W. Thomas, LL.B., B.Sc., A.M.I.E.E.

The Revision of the Schedule for Technical Staffs is now being carried out by a Committee of the National Joint Board. The aims of this revision are worth considering

THE Schedule at present in force was formulated by the National Joint Board in 1923 and was itself a revision of the first schedule adopted in 1920. It is worth noting that the salaries of the technical staff have been governed by a schedule for just over a decade; and notwithstanding the fears expressed by many in 1920 as to the practicability of applying a scale to salaried officials, the system has worked remarkably well.

The operation of the schedule has secured a measure of uniformity, has saved the time of chief engineers and committees, and has made for greater contentment and efficiency. It has been the magna carta of the technical staff; and a tribute ought to be paid to those who, when framing the first schedule, built on such solid foundations and made it possible for the status and remuneration of the technical staff to be more in keeping with the services rendered than was the case before the existence of the National Joint Board.

The conditions, however, which existed when the schedule of 1923 was framed have altered very considerably. The industry has expanded, undertakings and systems of supply have been linked up, and many new positions have been created.

The continuous application of the Schedule to these changing conditions has revealed many anomalies; gaps and omissions have been discovered and difficulties have been experienced in grading some of the positions. The District Boards have dealt manfully with many of the anomalies, but the time arrived when nothing less than a redrafting of the existing agreement became necessary. It was therefore decided by the National Joint Board to undertake a careful revision of the Schedule so as to incorporate the various decisions of the District and National Boards and in general make it better adapted to the changed structure of the industry.

The main purpose of the revision is not to bring about a general alteration in salaries either upwards or downwards; though it is obvious that a new schedule may have that effect on individual members of the staff. On the one hand, the general level is not too high, and there would be no justification for reducing it; while on the other, though some technical engineers may think themselves underpaid, the present time is certainly not an opportune one in which to put forward a general claim for increases.

The main features of the schedules of salaries and conditions of employment constitute in effect the standard conditions for the industry, and they are deemed to be incorporated in the contracts of service between undertakers who are parties to the National Joint Board and their technical staffs. By virtue of their membership of the National Joint Board, undertakers bind themselves to adopt the conditions and schedule and to apply them to their technical employés.

Continued on page 1045.

An undertaker as defined in the Schedule means an authorised undertaker as defined in the Electricity Supply Acts, 1882-1928. An employé means a member of the technical engineering staff as such other than a junior or student member employed under special contract.

The Basis of the Schedule

The fundamental assumptions on which the Schedule is based are that salaries should be commensurate with responsibility, and that responsibility depends partly on the position occupied by the employé and the size of his station or undertaking. When the first schedule was framed in 1920 very careful consideration was given to the best method of assessing the size of an undertaking or station. Some people favoured units output, or units sold, others maximum demand, and others plant capacity, while the more mathematically minded advocated a combination of all three. It was decided, however, that while the ideal basis would be one that took all the factors into consideration, it would prove too complicated in practice and would be above the head of the average town councillor. The most satisfactory basis was the simplest, and it was for that reason that plant capacity was finally chosen and undertakings and stations classed accordingly.

The method worked well from 1920-1923, except with those undertakings where the margin of spare plant was abnormal, *i.e.*, where there was a big discrepancy between the maximum demand and plant capacity. In order to deal with these anomalous cases, a modification was introduced in the revised Schedule of 1923 so as to give to undertakers the option of basing classification on maximum demand, plus 75 per cent., if that total figure was less than the total plant capacity.

Maximum Demand

The method adopted for measuring maximum demand was by ascertaining the average of the six highest weekly records of half hours output during the year. Though difficulty was occasionally experienced because certain undertakings did not make a practice of taking half-hourly readings, on the whole the method proved satisfactory and was a distinct advance on the previous basis. Experience since 1923, however, has demonstrated that plant capacity is becoming less appropriate owing to the changes made under the various linking-up schemes between undertakings, and that maximum demand gives a closer approximation to responsibility. It is probable that in the present revision maximum demand will be made the fundamental basis, though plant capacity may be utilised in special cases. The draft schedules submitted by both the employers' and employés' side of the National Board proposed this basis.

The 1926 Act has introduced into the industry a method of measuring maximum demand by taking the average of the monthly maximum demands during the year January to December with the proviso that where the maximum demand in any month is less than the maximum demand in the previous month that of the previous month shall be taken. As this method has statutory recognition, it has obviously much to recommend it, and it is probable that it will be adopted for the purposes of the schedule.

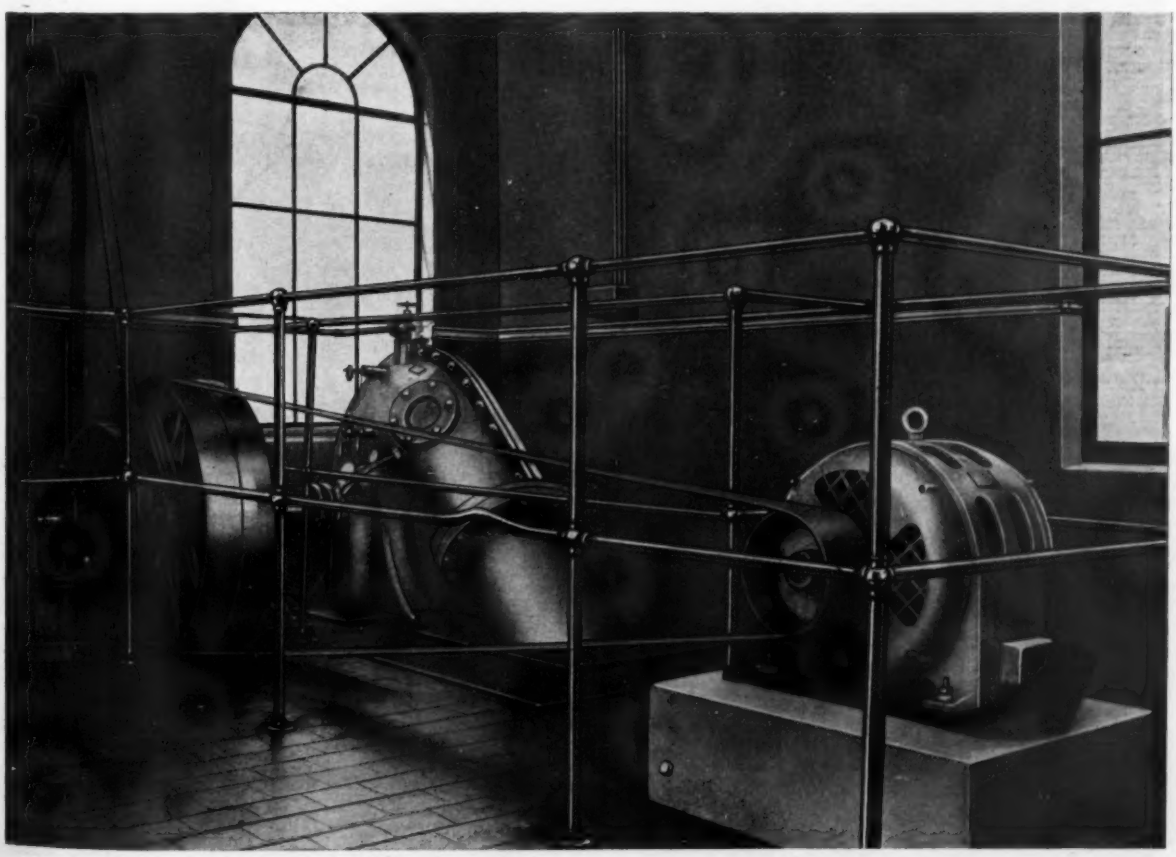
Classification

The Schedule divides undertakings into nine classes, the lowest commencing at 1,000 kW and the last embracing undertakings of 100,001 kW and over. Thus, if an undertaking exceeds 100,001 kW, it is put in Class J; and no matter how much its capacity may increase beyond that figure, its class, and incidentally the salaries of the staff, remain unchanged. There are now many undertakings which have long since exceeded that figure, and their number is continually increasing. Some extension of the classes beyond this limit has long been overdue, and the future will make an extension still more necessary if justice is to be done to the staffs on the large systems. The revised Schedule ought undoubtedly to make some provision to cover the large undertakings both of to-day and of to-morrow.

Another aspect of the Schedule which calls for attention is the classification of the distribution staffs. District engineers are now quite common on electricity undertakings, though they were not so in 1920 and 1923. Such engineers are usually in charge of definite districts; but the almost invariable practice has been for them to be classified on the total capacity of the undertaking. As, however, a district may expand quite out of proportion to the undertaking itself, some better basis than the capacity of the whole system should be found. The new Schedule will probably provide for basing the classification of engineers in charge of definite districts on the maximum demand in their district.

Grading

The salaries of technical engineers are determined under the schedule not only by the class of the undertaking or station, but by the position held. In the early days of electricity supply only a comparatively small number of clearly defined positions, such as chief engineer, deputy engineer, &c., existed. If an undertaking had all these positions occupied, it was regarded as being adequately staffed so far as the technical side was concerned. The 1920 Schedule catered only for these standard positions, and even the 1923 Schedule did not make any advance in this direction.



Electric Polder Pumping in Holland (see page 1038).

As undertakings, however, expanded in size and became more complex in character, specialisation commenced, and it became necessary to create other positions. The desire for economy in the boiler house led to the appointment of combustion engineers or boiler-house superintendents. In the generating station turbine-house superintendents, electrical superintendents, &c., became necessary; and on the distribution side meter superintendents, sub-station superintendents, and district engineers became recognised positions, while as the science of load-building was developed, commercial engineers and sales engineers came into prominence. In fixing the remuneration for these positions, undertakers had to make their own arrangements and agree with the employé concerned, subject in cases of difficulty to the approval of the District Joint Board. This meant an absence of uniformity throughout the country, with resulting dissatisfaction.

Cost of Living

One desirable improvement which it is hoped the revised schedule will introduce is in the setting out of the figures of salaries. In both previous schedules the figures were based on a cost-of-living figure which was 125 points above that of 1914. A casual observer of the document might suppose that the figures were those actually in operation; whereas, owing to the adjustments made in accordance with the sliding scale incorporated in the conditions of employment, they are far in excess of what are actually being received. The revised schedule ought to bring the figures down to make them correspond more with the true level, so that the uninitiated will not be deceived into thinking that the salaries paid to the technical staffs are higher than is actually the case.

The principle of varying salaries in accordance with the cost of living will no doubt be retained. Though there is something to be said for stabilisation, particularly from the point of view of simplicity and the saving of clerical work, one must bear in mind the fact that the cost of living has not yet reached bed-rock. The last few months have seen a gradual fall, and it would be most unwise to predict that there will not be further variations.

The Effects of the "Grid"

The activities of the Central Electricity Board are bringing about many changes in the supply industry which the framers of the existing schedule did not foresee. The linking-up of undertakings involves the creation of huge systems which must be subject to the control of engineers. A number of these control engineers have already been appointed and are operating in some of the districts. Their responsibilities are co-extensive with the system, and in a sense may be said to be determined by the system. Some arrangement ought therefore to be made whereby they can be classified in accordance with the maximum demand on their district. It is perhaps too early to attempt to cope with these special cases at present; but sooner or later they will have to be brought within the compass of the Schedule.

Another problem which will have to be dealt with, though possibly not until further experience has been gained, is the assessing of the extra remuneration due to the members of the technical staff of an undertaking because of the increased responsibility which falls upon them on account of their having to perform switching operations, &c., on the sub-stations belonging to the Central Electricity Board either on, or adjacent to, the premises of the undertaking. It would be unfair to expect that the maximum demand of these sub-stations should be added to the maximum demand of the undertaking itself, for the simple reason that the responsibility involved does not warrant it. At the same time, some provision should be made for increased remuneration, because there can be no doubt that a certain amount of extra responsibility is entailed. Such cases are obviously matters of mutual adjustment; but a revised schedule in the future ought to lay down some general principles which will serve as a guide when they are being dealt with.

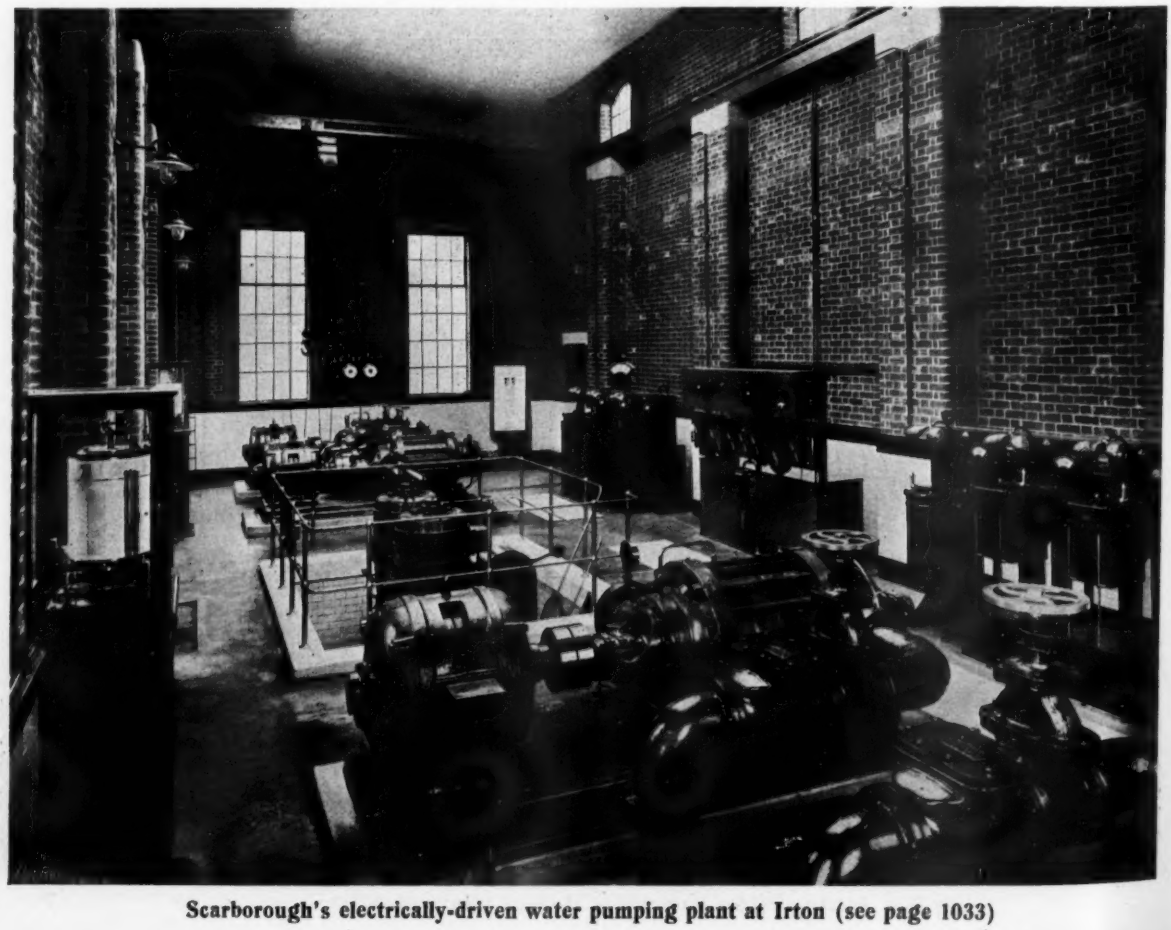
Other Anomalies

Anomalies are also likely to arise in connection with the manner in which stations controlled by the Central Board are run.

The existing Schedule was framed on the assumption that the generating stations would be worked practically continuously. Under the arrangements envisaged by the 1926 Act this will no longer hold in regard to some stations.

It is to be hoped also that a revised schedule will contain salary figures for the higher grades in the large undertakings. They were omitted in the 1923 Schedule because it was contended that the salaries for these higher paid men ought to be a matter of agreement, and that as a general rule they would be much better off than under a schedule.

There are a number of minor questions affecting holidays, sick leave and hours of duty, with which the revised schedule will probably deal that are not of a radical nature, but are modifications rendered necessary by the experience of the past few years.



Scarborough's electrically-driven water pumping plant at Irton **(see page 1033)**

Hire-purchase. By H. R. Taunton

Hire-purchase has taken its place in the sale of electrical appliances. The question here discussed by Mr. Taunton is the burning one—Which section of the industry shall employ it?

THERE are broadly speaking two disputants for the benefit of selling on this system—the supply companies and corporations on the one hand, and contractors and retailers on the other. The manufacturers and wholesalers may be assumed to stand for the present outside the ring. Some of them do approach the public with hire-purchase terms, or are willing enough if the public approach them; but they are mostly content to leave that particular form of trading to the supply people and the contractors, knowing that their own interests are served whoever sells their goods and by whatever methods.

The point at issue therefore boils down to this: Are supply companies and corporations fairly entitled to sell electrical apparatus to the public on hire-purchase terms in competition with, or to the entire supplanting of, the electrical contractors and retailers? To that supply authorities reply with a universal "Yes"; retailers, the staple of whose trade is threatened by the growing practice, as emphatically "No."

Most contractors will agree with the retailers; although some—particularly bigger firms whose main interest lies in their installation work, are more impartial, and seem prepared to concede some of their opponents' arguments, were it not for a spirit of loyalty to other members of the trade who rely more largely on their retail business; and were it not that, regrettably but rather naturally, many of them do actually look upon supply authorities as "opponents."

Mr. H. R. Taunton is well known to readers of the "Electrical Review," where his contributions on the problems and difficulties of the contractor, based on an intimate knowledge of installation matters, have long been appreciated. (*Photograph by Alexander Corbett.*)

Who is to Blame?

In theory, and in broad practice, supply authorities and contractors have interests in common, and they co-operate comfortably enough in advancing them. Both are working to the same end, to induce the public to think electrically, to wire more buildings and buy more apparatus for the increased consumption of current. It is in the methods adopted to that end that they differ: hence springs opposition—vague and often unrecognised, but always latent, and sometimes flaring to a quarrel.

For that the supply companies and corporations are chiefly to blame. They are inclined to be arbitrary and dictatorial in discussing the details of an intake or the balancing of an installation; they insist on regulations, often petty and irritating, which they have no legal power to enforce; and they are unaccommodating, sometimes from necessity but often from short-sighted conservatism, on the question of special tariffs. Some are worse than others, and there are of course exceptions. It is often—too often—a matter of the personality of the mains superintendent or his assistants. And on the other hand it must be admitted that some contractors are unreasonable in their expectation of easy compliance with their demands.

In the provinces there is the increasing tendency of supply authorities to carry out installation work themselves at uneconomic prices, or, at best, to farm it out at rates which can only yield a profit by a deplorable lowering of the standard of workmanship. The contractors' very livelihood is threatened. The practice grows, and is become an accepted factor in the extension of the "grid." Little wonder that the contractors ask what is their share in the co-operation expected of them; little wonder that they talk bitterly of unfair trading and, where a corporation is concerned, of rate-aided competition against them, ratepayers.

"Socialism in our Time"

It is all perhaps an inevitable development of "Socialism in our time," but it *is* socialism; and the contractor, necessarily individualistic and capitalist, cannot be expected to accept it cheerfully. The sound arguments that electricity is a public service, and that it can only be extended to a large body of small consumers on terms which he is unable to finance or to enforce, may perhaps appeal to his reason, but he is too biased by his emptying pockets to let himself be convinced.

It must be accepted, then, that there is a subdued antagonism between supply authorities and contractors; and unfortunately it clouds the issue on this question of hire-purchase of electrical apparatus. We must try and forget it if we are to judge the arguments on either side impartially. They are simple enough.

The supply authorities are only concerned to increase their load, and incidentally to flatten its curve. They can do that, first, by increasing the number of their consumers, either in co-operation with, or in competition with, the contractors. Secondly, they can increase the load of the individual consumers by persuading them to buy and use current-consuming apparatus, again with or without the aid of the contractor. Their argument is, shortly, that they can do that more extensively and efficiently without him. It is the only argument that can be expected to have any weight with them.

In the case of dwelling houses and small shops and offices, the classes of consumer to which hire-purchase most appeals, the lighting load has small and definite limits. The average in a small house is negligible when compared with the consumption of a single radiator. The only possibility of expansion, therefore, lies in encouraging the use of current-consuming apparatus, with the further advantage of gradually, by their diversity, filling up the valleys in the station output curve.

The companies obviously cannot be expected to forego such opportunities and advantages from any altruistic consideration for the profits of the contractors. The only effective reply to their activities in this direction is for the traders to do what the companies want done as fully as they want it done, as fully as they themselves are doing it, and as they will, in the other event, continue to do it. Presumably they would be very willing to be spared the trouble and expense of selling apparatus on any terms, and to confine themselves to their legitimate business of selling current, if they could be assured that the contractors would undertake what is necessary on the necessary scale.

Can the Contractors do it?

The whole question is, can they?

The supply authorities' answer to that is that they cannot: and therefore that no one can reasonably grumble if the sale of apparatus on hire-purchase terms, the only means by which the use of appliances can be extended to the required degree, is taken out of the hands of the retailers by the only bodies able to handle it, to wit, the authorities themselves.

The supply authorities are not primarily concerned with profit on the actual sales. The difference between the cost and the selling price of an electric iron is a flea-bite compared with the profit they may expect to get from the current it will consume. It pays them to sell it at cost price; it pays them to let it out at a nominal rental; or even to give it away to the willing consumer. That is what they do—and how can the contractor hope to compete with them under such conditions?

There is, of course, no question of hire-purchase terms where such inexpensive articles as irons are concerned; but they begin to apply as soon as we come to larger articles, such as radiators and cookers, the cost of which would usually be beyond the purse of small consumers if they had to pay spot cash. The users want to have them: the supply people want the users to have them: and hire-purchase is the obvious answer to their combined want. It is, after all, only to follow the precedent set by the gas companies.

If the cost of these larger articles were no more in proportion to their increased consumption than in the case of electric irons, it would pay the companies to treat them in the same way: to let them out on rental, or to give them to responsible users. But this is not usually the case. A small 3-kW cooker costs a great deal more than five 600-watt irons. The point is presently reached at which the cost of the article is more than the net profit to be expected from its consumption over a reasonable proportion of its effective life. That point is not always recognised, and the nominal rental charged by some corporations for apparatus, such as cookers in small tenements, is uneconomic.

There is, however, still a wide margin which can be covered by that elastic term, a " nominal rental "; and the advantage of planting current-consuming apparatus over a wide field is now so well recognised that the present tendency is to offer facilities for its acquisition more tempting, at least in appearance, than even hire-purchase terms. In such circumstances competition by the contractor is of course impossible. He cannot, as the companies can, offset a loss on the sale of an article by the profit on the current it will consume.

Nor is he really better off when it comes to straightforward hire-purchase. The more conservative authorities sell the greater part of their apparatus on those terms, and there are of course certain articles (*e.g.*, vacuum cleaners) which can reasonably only be sold on those terms—spot cash being assumed to be out of the question. The contractor may be willing to do the same,—to offer purchasers easy extended terms of payment. But what chance has he of profitable business in competition with a supply authority?

In all but the rarest cases he cannot afford to equip and serve a showroom on the same scale, nor to lay out the necessary capital in the purchase of stock and wait for years for his return on it. He has not the same facilities for getting into touch with prospective buyers, nor the obvious prestige of the supply authority. If it comes to the point of sheer competition the corporation or the company can always undercut his terms, with the assistance of their profit on the electricity which they can subsequently sell. And he has the further handicap of the expense of organising the collection of the periodical instalments, whereas the others have the machinery for that already at their disposal in the shape of their quarterly accounts.

Enforcing Payment of Instalments

Most important of all, the contractor can only enforce due payment of instalments by the clumsy and expensive processes of the law. The supply authorities have the enormous advantage that they can enforce them as they enforce payment of their quarterly accounts: by the threat of cutting off their service.

Only by a strong combination of a number of contractors, in particularly favourable circumstances and with the friendly co-operation of the local supply authority, could they hope to cater effectively for the public demand for electrical apparatus on hire-purchase terms. Such a concatenation appears to be very unlikely. It irks a contractor to have to write it, but it is no use shirking the fact, that this particular branch of the trade must inevitably be entirely lost to us in the near future. The contractors would have to resign themselves to it even if the supply authorities had no just arguments for their action. As it is, they can only admit the reasonableness of those arguments; digest the report, issued in June last, of the Committee on Assisted Wiring and the Hiring and Hire-purchase of Electrical Apparatus; agree that they cannot do what has to be done as effectively as can the authorities, and look elsewhere for the profits which may still reward their enterprise.

Unfair Trading

One last point they can defend. Some of the corporations and companies are using their showrooms not only for their ostensible purpose of developing the use of current-consuming apparatus, but for the cash sale at competition prices of every kind of electrical accessory—fittings, lamps, shades, novelties, and even wireless gear. That is not their legitimate business. It is unscrupulously unfair trading. It is greedy and petty. Contractors and retailers have every right to protest against it, and, through their organisation, to take the strongest steps to make their protests effective. If they must resign to the supply authorities the plums—not to mention the currants—in the cake, at least let some of the crumbs be left to them.

Electric Fires and Cookers. By C. R. Belling, M.I.E.E.

A story of progress entertainingly told

YOUR request for my views on electric fires and cookers reminds me that I have been mixed up in this trade now for about 20 years.

After an apprenticeship and staff job at Crompton's, I left to join Ediswan's, looking after auto transformers, arc lamps, and other oddments. Soon the Bastian heaters were taken over by Ediswan's and came under my section. Here started practically the first " red-hot " electric fire—a spiral running at a bright red temperature in a quartz tube. Many were the designs we made, and large the quantity sold, even in those starting-off days.

I left Ediswan's to start up on my own account in August, 1912. I had then two sleeping partners, and we each put in £125 in cash, making a total capital of £375 with which we kicked off in a small garage—myself, a foreman, and a boy. Actually I commenced with the idea of making electric geysers; and while they were quite successful from the point of view of producing hot water, their sale was nil, owing to the fact that they consumed 20 kW, which no engineer in those days would even think about for that purpose.

The First Belling Fire

I soon switched over to electric fires, and took out my first patent in the same year (1912), for what was perhaps the first practical red-hot firebar of the present-day type, namely, a spiral supported on one side of a fireclay bar.

My old original " Standard " fire, which, with certain minor alterations in design, we sold for fifteen years, had four practical features which even to-day are the essential points of the most modern fire. They were:—(1) The fire was large enough to block up the ordinary coal fire opening; (2) the bars became red-hot quickly and gave off an intense heat; (3) a sheet of moulded glass was fitted at the bottom with an amber lamp to get a pleasing coal-fire effect; (4) there was a shelf above the bars on which to warm things.

As far as I know, this was the first fireclay bar type of fire on the market in this country. There were fireclay imitation " log " fires in Germany, even with revolving flicker devices before this date, and a few had been sold on this side, but they were hardly the same. Most other radiators on the market here when I started were of the lamp type. There were, however, " convector "-type fires, consisting of low-temperature spirals warming a stream of air. These convectors had usually an amber lamp and a moulded coloured glass window to give a cheery effect.

For the first two years I had practically a monopoly, and soon moved to larger works; then, owing to the war and other circumstances, I bought out both my sleeping partners. During the war we changed over to various kinds of electrical work for the Admiralty, and fires of the ordinary kind were side-tracked. Soon after the war we had to face up to competition from all quarters.

My original firebar ran for about nine years. Then we changed over to our well-known " Multi-parabola " bar, which has now been going nine years.

Further Advance in Design

This year we shall lead the way again, I think, with an entirely new patent firebar, which I feel is definitely another step forward in electric fire design. The spiral lies in horizontal channels, and is held in place by an irregular formation of the front, much like small pieces of coal. It does away with the somewhat mechanical, and too regular, appearance of the present-day ordinary fireclay firebar, and gives us one which even when fixed right in front of the fire looks wonderfully attractive when switched on, and quite inconspicuous when switched off. It is surmounted by the usual imitation coal with flickering flame and smoke effect, which can be " on " alone. The main practical advantage is that you get the radiant heat where you want it—direct into the room, and down at foot level, the source of the heat being " camouflaged " when not in use.

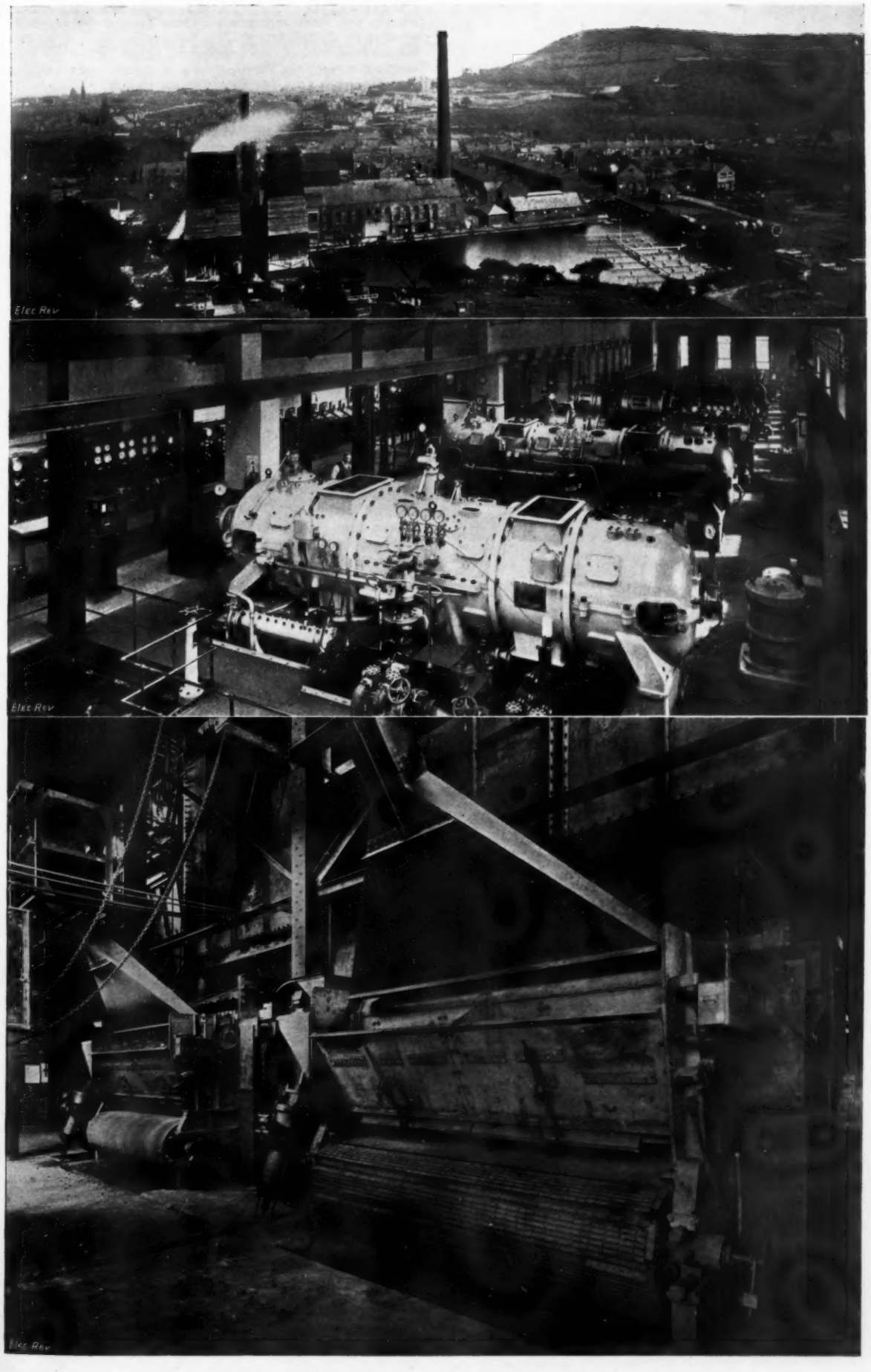
While I have been in the business, tubular heating has made considerable strides for particular purposes. Slab-type low-temperature radiators used as panels on walls, and overhead for certain types of heating, have been installed.

Busy Times Ahead

Anyway, a two-bar 2-kW fire for ordinary domestic use has the biggest sale at the present time. We sold about 30,000 of this type alone last season, and there are perhaps 75 other firms making the same article, so the total output must be pretty big.

There is keen competition in the fire trade which keeps things " merry and bright "; is responsible for the exertion of extreme ingenuity; and ensures the consumer getting excellent value for his money. With the price per unit coming down to the ¾d. point almost everywhere, the cost of wiring getting much more reasonable, and the fire itself at a wonderfully low figure, it seems to me certain that to have an electric radiator in every room will soon be the universal practice. Personally, I think the cheery-looking portable radiant bar type will hold the field for several years.

In my own house I should certainly pump into every room filtered fresh air electrically warmed (by passing the air over a large surface of low-temperature resistance spiral), at a



Representative views of the Scarborough Electricity Works: the exterior: the turbine room: the boiler house **(see page 1034)**

Mr. C. R. Belling, M.I.E.E., is an electric heating specialist, having been connected with the industry, as he tells here, for the last twenty years. The continued extensions of the works of his Company at Enfield testify to the increasing demand for cookers, fires and water heaters. (*Photograph by Elliott & Fry, Ltd.*)

thermostatically-controlled constant temperature, suitably exhausting the used air. In addition, I should have a radiant fire in each room for use when required. This equipment would in summer supply the house with cooled air.

This house I have wanted to commence building for several years now, but instead have had to use any little pocket-money I may make in building new bays to the factory. We are just starting four more bays now, even in these difficult times.

CONCERNING COOKERS

On looking through some old papers, I see that my first advertisement in this connection appeared in the early part of 1913. We bought ordinary cast-iron gas cooker bodies, fitted these with our ordinary radiant elements on each side of the oven, and a hob on top. The hob had a boiler-griller and three separate open-type boilers. We sold a good number of these, but the boilers were not too successful.

In about 1919 we started again on cookers, this time of a sheet-metal design somewhat following American products. These, however, were not successful, engineers apparently preferring the heavier cast-iron type. Two years afterwards we changed back once more to the cast-iron pattern and began introducing enamel. Last year our cookers were half black and half enamel. This year our cookers are all enamel, and we make no other.

Boiling rings are still a problem. The solid metal-type boilers are, broadly speaking, preferred by engineers, owing to their strength and life. There is no doubt, however, that the public prefer a boiler with visible radiant heat; and, in my own opinion, a strong fireclay type of boiling ring with visible spirals is likely to be the eventual solution. It is the cheapest kind to make; and it is the fastest boiler under ordinary commercial conditions; and it does away with the necessity for absolutely flat cooking utensils, and so on.

I do not know how many tens of thousands we have sold of our old No. 7 boiling ring, which we first made about ten years ago. The essence of its design was a red-hot spiral seated on porcelain knife edges, with ample drainage to get rid of any spilt liquids. This element was then protected by a perforated cast-iron top, upon which the utensil was placed. At the present time, the double-duty boiler-griller is certainly coming to the fore. This we have preached and made for several years; it is undoubtedly economical in use, and this is a good selling point which must appeal to the housewife.

Ovens are now enamelled inside and out, and have rounded corners and other refinements. The heating arrangements seem to be divided between top and bottom heat, or side and bottom heat. We ourselves adopt the former, which gives the simplest wiring, the simplest oven, a greater variety of heat control, and a very low temperature when required. We think it is a big advantage to be able to tell the consumer to turn the bottom element into the "low" position, when she can safely leave the oven to look after itself, while she carries on with the housework, or goes out to do shopping without any fear of the temperature rising.

Many makers adopt a visible radiant heat type of oven elements. We run ours at a black temperature. Our spiral is a long one and has a large emitting surface. The pancake element itself is free to give off its heat on both sides. It seems to me that with a black heat the novice in cooking is safer, and is not so likely to burn food as with radiant heat. Also, the oven can be packed a little fuller. Incidentally, of course, the heating elements run at a low temperature and are practically everlasting.

A Vast Field Untouched

There is a vast field for electric cookers and, at the present time, it is practically unscratched. In my own opinion, however, the supply companies are not tackling the job in the proper way. They seem to forget that the electric cooker has to compete with the gas cooker, and in order to do this they will have to adopt the same tactics as the gas companies, who have 40 years' experience behind them.

First, the electric supply authorities have to get the idea of making their profits out of the sale of electricity rather than on the trading department of their showrooms. Electric cookers should have only the same discounts on them as gas cookers: this would then bring the list price of the electric cooker almost into line with that of the gas cooker. Here is one of the reasons why the public generally have been frightened off electricity. The big discounts involved keep the prices high, and people notice how much more expensive the electric cooker is to buy than the gas cooker. Of course, this does not apply quite so much where electric cookers are let out on hire. The cost of demonstrations, showroom expenses, maintenance, obsolescence, depreciation, &c., should just be a straight charge against the revenue for electricity sold.

Wiring for cookers should generally be free, and the cookers hired out at a nominal charge, at any rate, not more than the hiring charge for a gas cooker of the same size in the same town. The hire of cookers up to now seems to have been based on certain cost and maintenance figures, instead of being developed from a psychological point of view.

I feel certain that in nine cases out of ten a consumer would rather pay, say, 3s. 6d. per quarter for the hire of her cooker, and ¾d. per unit for the electricity used, than be charged 7s. 6d. per quarter for the hire of her cooker and ¼d. per unit for the electricity used, although in the former case she would probably be paying the supply company about 25s. a year more, supposing the units used on the cooker during the course of the year were about 2,000.

All Included in the Unit Rate

If we are to make electricity popular, installation charges, meter charges, and, in fact, all incidental charges, will have to be included in the price of the unit.

To-day the ordinary consumer finds it a most difficult matter to use electricity. The different prices and conditions under which it is supplied in one town alone are confusing to the average person. For electricity to bound ahead, something drastic is required in the way of simplifying the routine of getting a supply laid on, and simplifying the method of charging for it. When this comes about and the grid system is fully extended, gas for ordinary domestic purposes will very soon be extinct.

The first supply authority with big vision that supplies any quantity, to anybody, at any time, for any purposes, at a flat rate of ¾d. per unit—no extras, no restrictions of any kind, will set the pace and make a big fortune. Very soon, in addition to an electric fire in every room, there will be an electric cooker in every kitchen, and all the other electrical gadgets will follow.

Municipal Trading at Sydney

THE advisability of retaining the appliance sales branch of the Electricity Department was questioned recently at a meeting of the Sydney (N.S.W.) City Council. The accounts presented showed a loss of £3,233 for the past year. Mr. Forbes Mackay, the general manager of the undertaking, defended the sales branch on the ground that it greatly increased the sale of electricity.

Industrial Heating. By W.E. Swale, A.M.Inst.C.E., A M.I.E.E.

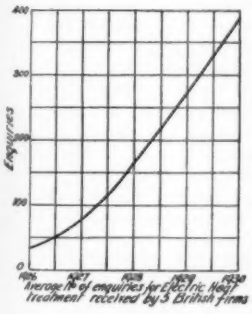
Some electric heating processes in the light of their value to the supply undertaking

IN certain directions development of industrial electric heating apparatus has been slow. The illustrations of a two-deck roasting oven, of a towel steriliser, or of a lead-melting pot which appeared in the ELECTRICAL REVIEW in 1904 (October 21st, p. 675) are astonishing to-day, because their outward appearance has changed so little in more than a quarter of a century. It is only in the last ten years, in fact, that any rapid progress has been made in the more obvious applications of electric heat.

The curve on this page shows how the number of inquiries received by specialist firms for engineering furnaces has soared. This enthusiasm has been mainly stimulated by the extraordinary development of electric heating in American engineering practice. The recent British Industries Fair contained a most representative collection of industrial and commercial heating plant; while the ever-growing space allotted in the technical Press leaves no doubt about the rapidly-increasing importance of the heating load.

The tenor of the technical Press in heating matters is often one of exuberant confidence. The manufacturer, naturally enough, preserves a discreet silence regarding his failures. So that there is thus all the more reason for the supply industry to move circumspectly in dealing with novel applications, and to remind itself that its primary obligation is to serve equally the interests of all classes of its consumers. The E.D.A. will have no difficulty in answering the topical question: "Do we believe our own story?" if the "story" itself is technically and economically sound.

Mr. Swale is Power Sales Engineer to the Manchester Corporation Electricity Department, and has made a close study of industrial heating from the supply point of view. (*Photograph by Elliott & Fry, Ltd.*)



Average No. of enquiries for Electric Heat treatment received by 5 British firms

Purely engineering applications of electric heat have developed—generally speaking—on unimpeachable lines, simply because in modern industrial conditions the chaff is soon winnowed from the grain. In certain other lines of development, however, the traditional caution of the British manufacturer has not been so evident, and some of the plant which has been sold has done harm to the cause of electric heating. I grant that such cases are few, but experience bought at some cost should be utilised to the full so as to avoid further pitfalls.

Any connection which is to prove of permanent value to a supply undertaking must possess the three attributes—

(*a*) satisfactory and competitive functioning;
(*b*) reasonable cost of upkeep;
(*c*) adequate revenue-earning capacity.

This "yard-stick" should be applied rigorously to industrial and commercial heating plant, as failure in any one direction injures the fair name of electrical service.

In the table on the next page I have made an attempt to indicate on broad lines the characteristics of certain typical electric heating processes, and to assess their relative value according to these three headings, under which industrial and commercial processes fall naturally,—

(i) manufacturing uses;
(ii) commercial food preparation;
(iii) seasonal building heating.

The vitality of the electric heating load to the supply undertaking, as a class of potential business, may be seen on looking at the table, a glance at which suggests various considerations each of which might be ventilated with advantage.

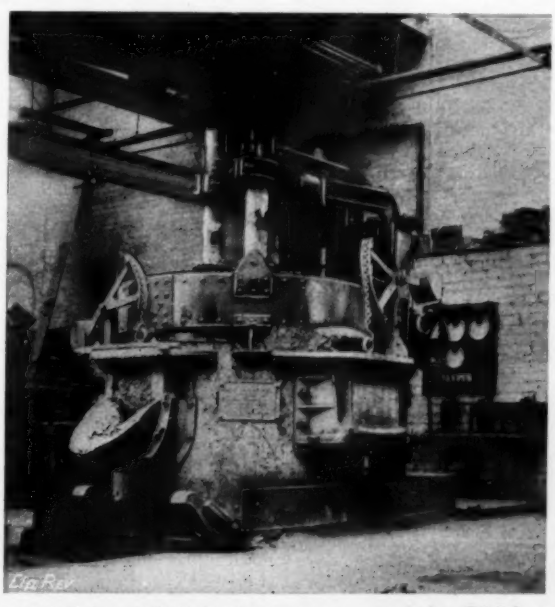
The applications grouped as manufacturing uses are mainly concerned with plant that has reached a high degree of utility, judged by all three standards just mentioned.

One illustration on this page shows a ½-ton 350-kW arc furnace operating highly successfully in Messrs. Mather & Platt's foundry in Manchester. The furnace is used for the rapid melting and mixing of alloys, and considerable quantities of workshop scrap metal are refined for reuse.

The *Daily Mail*, Manchester, is to be congratulated on equipping what is the first "all-electric" foundry in Europe; and the photograph on page 1054 shows three out of the four 120-kW electrically-heated auto-stereotype pots. The total industrial heating load at Northcliffe House, Manchester, is now 620 kW. These are both examples of satisfactory heating installations.

Application No. 6 is classed "good," "satisfactory," or "questionable" in each case to indicate that considerable discretion is still needed. The conversion of existing appliances to electric heating, for example, is sound in some instances; in others, the results may be calamitous. Conscientious manufacturers are aware of this, and will definitely advise against ill-considered experiments. The American design of cast-in "Helicoil" heating element, by the way, is well suited to the conversion of small metal melting pots. Local steam-raising by electricity, again, may be thoroughly sound in some circumstances, and ill-advised in others.

It is curious that arc, butt, and spot welding (heading 7) are sadly neglected by some supply authorities, presumably because machines of this class bring in a very small revenue compared with their kW capacity. I suggest that the propaganda value of a modern spot-welding machine, for instance, is considerable, owing to the remarkable saving in manufacturing costs which it may show. Electric welding plant, of one kind or another, is indispensable in many mass-production processes; this alone has been sufficient to persuade owners to come over to the supply authority rather than to continue with private generation of electricity. For this reason all possibilities in this class should be carefully investigated.



A Half-ton 350-kW Arc Furnace used for Melting Alloys at Messrs. Mather & Platt's

The second group—food preparation—covers some processes about which there can be no doubt, and others in which great care is needed to obtain satisfaction. In bread baking, points (*a*) and (*b*) are beyond dispute; the adequacy of the revenue to the undertaking is largely affe ted by the question of night baking. In my experience there is much scope for confectionery baking in small ovens (application 9) at rates up to 0.75d. per kWh for a restricted day load.

Restaurant and canteen cooking has a great future, but it must clearly be approached with caution. Whether it is satisfactory to the user is largely in the manufacturers' own hands, and improvements in detail are still necessary; qualified demonstrators should be available in the early stages of operation. A reasonable cost for upkeep can only be maintained at "good" by the provision of efficient after-service by the supply undertaking, as the service rendered by manufacturers after the

guarantee period has expired is usually inadequate. In view of this after-service, and also the relatively poor diversity of commercial cooking loads, it is a mistake to attract business by too-low rates. Electrical cooking will progress satisfactorily by reason of its intrinsic merits. If steam from fuel-fired boilers has to be provided for building-heating or process work, its use should certainly be advocated for steaming and boiling in the canteen.

The application to fish-and-chip ranges (11) has suffered from the experiments of incompetent cooking "engineers," some of whom have failed financially, leaving their unsatisfactory offspring to the care of the supply authorities. The unfounded belief that electric fish-frying is only commercially possible at rates of 0.5d. per kWh has had an unfortunate effect in depressing other cooking rates. There is no justification for regarding the cooking load as a class apart, to be "protected" by unscientific flat rates of charge. If a sound compound tariff is unacceptable to the class of consumer under consideration, the supply authority should offer a "block" tariff, having the first step directly dependent on kW connected, so that the revenue from any one installation bears some relation to its maximum demand and load factor.

Building-heating provides many interesting problems, and certain of its applications are more contentious than those of groups 1 or 2. A number of high-voltage thermal-storage installations are now at work, and further developments will depend largely on the results obtained with these. From the point of view of the undertaking, such plants are, as far as one can judge at the moment, unexceptionable. Application 13 (l.v. immersion heaters for thermal-storage plant) has unfortunately produced an ill-conceived appliance in the oil-storage heater, which is likely to fail completely, and cause disappointment and loss to the luckless purchasers. A number of low-voltage thermal-storage schemes employing immersion heaters in water-storage tanks are in satisfactory operation. Unless circumstances enable an exceptionally high value to be attached to the "convenience" of a thermal-storage scheme, it is difficult to see how even this can be justified on a rational low-voltage tariff.

Direct air heating by electric fires, &c. (application 14) covers a large variety of "direct" air-heaters," which are, as far as one can see, unexceptionable to the consumer (points *a* and *b*), but may, in certain circumstances, be an embarrassment to the supply authority so far as an adequate revenue (point *c*) is concerned. In extreme weather conditions the diversity between direct air-heating plants is negligible. In spite of the ingenious arguments of certain manufacturers who claim to have "overcome Nature's handicap of 3,412 B.th.u. per kWh," the supply industry should walk warily before offering low-voltage rates of less than 1½d. and 1d. per kWh for "peak" and "off-peak" room-heating loads, respectively, even at the risk of losing some potential business.

The directions of electrical development are, surely, in the order of their importance—lighting, power, and high-temperature heating. A municipal authority in particular, which holds a position of trusteeship for the general body of ratepayers, is not justified in offering exceptional rates for any new class of business unless it is proved conclusively that such business lowers the cost of production of the system as a whole. There are certainly many instances in which direct electric space heating is thoroughly justified by its convenience, cleanliness, and the automatic temperature regulation it provides; and such cases should be assiduously encouraged. The use of fully-automatic thermostatic control undoubtedly moves this type of load into a more favourable light; but even then the depression of tariffs to meet the least favourable cases cannot be looked upon as sound finance.

The conclusions we may draw are encouraging to the electricity supply industry. A great many applications of electric heat are established beyond doubt, and will prove invaluable in raising system load factors. In certain lines of development a pooling of experience amongst undertakings would be beneficial.

A "live" undertaking will stimulate the legitimate industrial heating load by every means at its command. The main points to bear in mind appear to be—

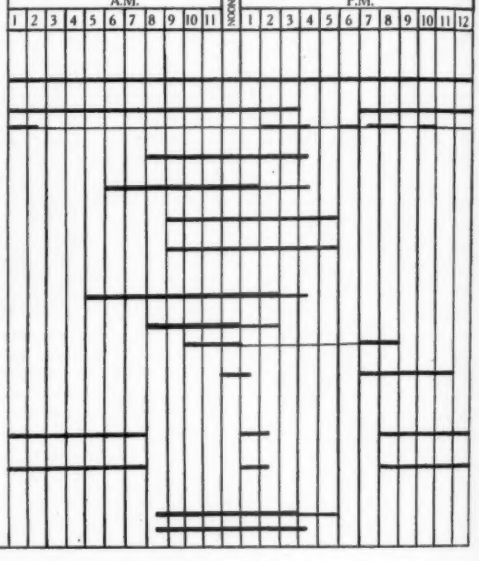
1. To base tariffs on sound economic lines, and "sell" the applications by virtue of the unequalled advantages of electricity.
2. To recognise that some processes will always have to be left to alternative sources of energy.
3. To persuade the consumer to buy only apparatus of proved reliability, even if the first cost is high.
4. To provide "after service" in all cases where a qualified technical staff is not kept on the premises.

Many supply authorities have not yet established that intimate contact with their consumers which results in free interchange of advice and ideas. The persistent "studying of the industrial user," which I have advocated elsewhere, should lead to an atmosphere of confidence and co-operation, and so favour a rapid expansion of the industrial heating load to the benefit alike of the consumer and of the undertaking.

CHARACTERISTICS OF SOME ELECTRIC HEATING PROCESSES

APPLICATION	Approximate Annual Load Factor %	Relative Value of Three Basic Attributes (a) Satisfactory and Competitive Function	(b) Reasonable Cost of Upkeep	(c) Adequate Revenue to Undertaking
Group I.—Manufacturing Uses				
(1) Enamelling of ceramic ware in tunnel oven	88	Good	Good	Good
(2) Melting metals in arc, resistance, or induction furnace	20	Good	Good	Good
(3) Auto-stereotype pots, newspaper foundry	45	Good	Good	Good
(4) High-temperature heat treatment, engineering shops	9	Good	Good	Good
(5) Enamelling, baking, drying in box-type ovens	9	Good	Good	Good
(6) Miscellaneous uses of "clamp-on" and "built-in" heaters, steam-raising, etc.	5	Good, Satisfactory or Questionable	Good, Satisfactory or Questionable	Satisfactory
(7) Arc, butt, and spot welding, etc.	5	Good	Good	Satisfactory
Group II.—Food Preparation				
(8) Bread baking	17	Good	Good	Satisfactory or Questionable
(9) Confectionery baking in small ovens	18	Good	Good	Good
(10) Restaurant and canteen cooking	15	Good or Satisfactory	Satisfactory	Satisfactory
(11) Fish and chip ranges	15	Satisfactory	Satisfactory or Questionable	Satisfactory or Questionable
Group III.—Building Heating, i.e., Seasonal Load				
(12) Electrode heaters for thermal storage plant	11	Good	Good	Good
(13) L.v. immersion heaters, for thermal storage plant	11	Good	Satisfactory	Satisfactory
(14) Direct air heating by electric fires, tubular or panel-type radiators, etc. :—				
(a) Office building or small works	11	Good	Good	Questionable
(b) Day school	8	Good	Good	Questionable

Incidence of Mid-winter Demands (the thickness of the lines indicates, roughly, the proportion of full load)



Ultra-violet Radiation

THE spectral erythemic response curve of untanned human skin and the energy required to produce a mild erythema are of importance in connection with the question of the unit of dosage and methods of standardising the dosage of ultra-violet radiation used for healing purposes. A paper delivered to the National Academy of Sciences (U.S.A.) by W. W. Coblentz, R. Stair and J. M. Hogue and referred to in *Science*, gives new data on the spectral response of a small group of subjects differing widely in erythematic susceptibility. The experimental procedure consisted in irradiating the inner forearm with a monochromatic spectral line and, from a succession of exposures, selecting the one that produced a minimum perceptible erythema.

The spectral erythemic response curve so obtained agrees with observations obtained by other methods. The energy required to produce a minimum perceptible erythema upon 1 sq. cm. of untanned human skin, using monochromatic radiation of wavelength 297 mμ (the wavelength of maximum erythematic susceptibility), is of the order of 500,000 ergs.

Steam Raising. By Percy E. Rycroft, M.B.E., M.I.E.E.

An electrical power station must be treated strictly as an industrial factory for producing cheap electricity

STEAM is electricity's raw material. Even under super-production conditions the coal required to produce it accounts for about one-half of the running costs. Steam raising, therefore, not only deserves but demands the electrical engineer's closest attention.

In spite of all that has been said and written on combustion problems during the last few years our power houses still leave much to be desired. It is an undoubted fact, for instance, that there are stations using prime movers of identical design, and consuming the same amount of steam per kWh, which show widely divergent over-all efficiencies and equally divergent costs of production. The reason in such cases will almost always be found on the steam-producing side, either in a bad layout, in indifferent operation, in heavy capital and maintenance charges, or in a combination of them.

Operation has been written about, lectured about, talked about, and discussed to such an extent during recent years that there can scarcely be a stoker in the land who does not know the results expected from him. Still the fact remains that in far too many instances the theoretically correct results are not forthcoming. Layout has been considered to a less extent, but has still had a good deal of attention.

During a lengthy experience two fundamental facts have impressed themselves upon my mind. The first is that technical efficiency has an alarming tendency to outstrip commercial efficiency, and the second that far too many power station engineers would rather pile gadget upon gadget than study first principles and concentrate on obtaining the best possible results from simple plant of orthodox design. Yet the evidence in favour of simple plants is overwhelming; and an intelligent examination of the Electricity Commissioners' Annual Returns, in conjunction with Garcke's Manual and other authorities, will give a very good indication where merit lies and of the type of plant which earns it. In other articles I have enlarged upon this theme, and there is no need to pursue it here.

It may, however, prove of some value to follow the line of reasoning and to consider in some detail the underlying principles by which I have been guided in laying down an installation.

Mr. Rycroft is the engineer and general manager of the Great Yarmouth Corporation Electricity Undertaking, his earlier experience being on the London staff of Babcock & Wilcox, Ltd. Before this he was with the Board of Trade Coal Mines Department. The Yarmouth station has been selected for operation by the Central Electricity Board. (*Photograph by Elliott & Fry*).

Essentially an Electricity Factory

To begin with it should be clear that an electric power station must be treated strictly as an industrial factory for producing cheap electricity. It is not a research station, and it should not be considered an experimental laboratory. Its defined object and purpose (during recent years at any rate) is to produce a cheap and abundant supply of electricity. To do this we must have:—

(1) Low capital cost.
(2) Simple, foolproof, and robust plant.
(3) Low operating cost.
(4) Continuously high efficiency.
(5) Low maintenance cost.
(6) Absolute reliability.

Low Capital Cost

It is of the utmost importance to realise at the beginning that capital cost forms a very high proportion of all kWh charges, and that when once it has been incurred (unlike operating cost) there is no hope of a reduction until the debt has been liquidated. It is true that by spreading a capital charge over a large number of kWh by the development of a high load factor the charge per kWh may be lessened; but still better results will be obtained if due regard is given to the cost per kilowatt installed before we begin.

Insistence on low capital cost must not, of course, be confused with a demand for the purchase of cheap plant, or for the provision of shoddy buildings and indifferent equipment. This would not in the end produce low capital charges, and is no part of my creed.

Low capital cost implies special attention to laying out, in the simplest possible way, the general design of the installation. If in the design of a boiler house your fancy soars to the cathedral type, on the score of a saving in ground space, go into the matter closely to see if the little extra cost of ground is not much more than saved by keeping the total height down. If you have ambitions to obtain a half per cent. better technical efficiency than anyone else, go closely into the cost of getting it before you place the order for all the gadgets involved. Adopt standard designs of plant as far as you possibly can. A standard design is usually developed from the rectification of scores of complaints. By accepting it you obtain the full benefit of other engineers' experience and it is less costly than the introduction of your own ideas. Go closely into the question of foundation and building costs. A great deal of money can be wasted on building costs without obtaining a comparable effect. Consider also the *simplest* method of handling your coal and ashes. In short, do not include an ounce of material in your design which does not serve some definite purpose and achieve its object in the simplest possible way.

Simple, Fool-proof, Robust Plant

One effect of paying close attention to capital cost is that almost of necessity a certain simplicity is automatically introduced into the layout. This is all to the good. We can next approach the problem of robustness. For my own use I unhesitatingly adopt the sectional "horizontal" type of boiler with vertical "staggered" headers, convinced, as I am, that the even spacing of the tubes, only rendered possible by "staggering," is a real and permanent advantage. For the economisers the cast iron, high velocity, gilled-tube type has been selected, both on account of their resistance to possible corrosion and suitability for the working pressure adopted (400 lb. per sq. in.).

The size of unit is, of course, dependent upon the size of the prime movers with which it is to be associated. In this particular instance turbo-generators of 20,000 kW are contemplated, and a steam unit of 100,000 lb. (m.c.r.) evaporation per hour has been adopted. It will be seen that for two turbine units five steam units will be the correct running proportion; the secret of all successful steam plants being easy steaming at normal load with m.c.r. reserve for emergencies.

Air pre-heaters have not been adopted because an efficiency of 86 per cent. can be obtained with economisers only, and it was difficult to justify the additional capital cost which their inclusion would have entailed. In addition to this, however, it is not always realised that the utilisation of pre-heated air involves the continuous use of mechanical draught, while the air pre-heater introduces additional resistance in the flue-gas circuit and so further increases the power demanded to provide the draught (all of which comes under the heading of "complications to be avoided whenever possible").

Actually full provision has been made for applying both induced and forced draught when the occasion warrants it; but a chimney has been installed of sufficient height (150 ft.) to enable the plant to carry a high proportion of the load without the expenditure of any power for mechanical draught.

Low Operating Costs

Operating costs are so bound up with the question of design, and design is so relative to capital cost, that it is not always easy to write of one without referring to the other. The question of power absorption for the provision of draught and other "internal" purposes of the steam raising plant all has a very important bearing on the net amount of power provided by the consumption of a given quantity of fuel and available for actual distribution and sale. The ratio between the actual power developed in a plant and the amount finally available for distribution is, of course, its real measure of efficiency.

Seven-ton Electrically-heated Auto-Stereotype Machines in the Foundry of the " Daily Mail " at Northcliffe House, Manchester. (See page 1051.)

Therefore any means by which power consumption can be avoided in the plant itself should be welcomed as an aid to the production of low net operating costs.

The application of this principle definitely disposed of any possibility of adopting powdered fuel firing; although in this particular instance there was ample reason for its rejection as a possible source of nuisance. Chain-grate stokers are being installed, and the maximum power absorbed in running the plant is not likely to exceed 5 h.p., or, say, one-twentieth of one per cent. of the power produced. The complete unit is so arranged that the draught resistance is low; consequently 50 per cent. load can be obtained without any mechanical draught at all, the full normal load can be obtained with induced draught only, and the forced draught is only brought into use for the m.c.r. loading and temporary overload. By this means power consumption for the provision of draught is reduced to the lowest possible point. All motors are, of course, fitted with ball bearings.

Continuously High Efficiency

The whole secret of low operating cost is really contained in the stressing of the word *continuous* when talking of efficiencies. It is not nearly so difficult under highly-skilled supervision to obtain a high test record as it is to maintain a reasonable efficiency under all conditions of load and under normal methods of running, even assuming that the operators in charge are of good average training and capacity. More often than not the trouble lies in the inaccessibility of the auxiliary plant and a lack of really easy and *comfortable* facilities for making systematic observations.

The word " comfort " may seem strange here; but comfort has a most important bearing on a proper and continuous inspection of a running plant, without which continuous efficiency is impossible. If, for instance, the peepholes of a furnace are so arranged that it is very difficult for the stoker to see the fire without a number of more or less painful contortions, it can be taken for granted that very few observations will be attempted. Uneven fires will not be rectified and efficiency will be lowered.

All controls whether mechanical or electrical should be so arranged as to be operated from the firing floor, and both fans and pumps should be at this level. Not only must soot blowers be installed, but they must be systematically and intelligently operated. Further than this, the flue dust—there is, of course, no " soot " in a properly operated plant—after it has been blown off the tubes, must have reasonable pockets or grit chambers in which to settle, from which it is either automatically or very readily removable. The formation of clinker on the side walls may easily ruin the furnace efficiency of a travelling grate by impeding the free travel of the coal; and water boxes should be installed to overcome this particular trouble.

Low Maintenance Cost

Stress has already been laid on the value of accessibility for promoting continuous efficiency. It is no less important from the point of view of low maintenance, the argument being that with all plants everything accessible is both seen and clean, while vulnerable parts inaccessible are invariably neither. A clean plant is bound to require less maintenance than a dirty one; for the very good reason that systematic cleaning is bound to show up any slight defects such as loose nuts, leaks, and so on, before they have a chance to become serious. In other words, steam plants are no less amenable to the " stitch in time " philosophy than most other things.

Another essential of low maintenance cost is easy running. It is false economy to over-run any plant, and many otherwise well arranged stations fail in this respect. Not only will over-run plant sooner or later demand extensive repairs, but more often than not it will also fail at some inconvenient time and possibly necessitate inefficient running.

Another contributor to high maintenance cost is excessive speed. In many stations fans, pumps, conveyors, motors, ash plants, and other auxiliaries are all running far too fast. In fact, it is true to say that many of these plants wear themselves out, not by the work they do but simply by running themselves round. This is sometimes especially noticeable in ash hoists; and the clatter and bang of this type of apparatus proclaims aloud the inefficiency of its designer. The speed of all such plant should bear some relation to the amount of material which it has to convey. It is usually quite a small relative quantity per hour; and a slow speed not only saves maintenance in itself, but avoids the raising both of dust—another contributor to high maintenance—and of noise, which is not only an indicator of inefficiency but an ever-increasing contributory cause.

Absolute Reliability

These two words sum up the essence of the five preceding sections. Unless this reliability is assured high efficiency is impossible. Unless you are *sure* of your plant other plant must always be run as stand-by, and all hope of real efficiency is immediately lost.

It is always advisable to be sure. If, for instance, there is any doubt about furnace brickwork holding up, or any hesitancy whether economiser tubes will stand corrosion, or whether a particular fuel is " man enough " to carry the peak load, the engineer-in-charge will be spending days and nights of misery; his efficiency may fall below even that of the plant. It is utterly useless to think of or to worry about such things after the plant is on load; the proper time to make decisions affecting design is before the plant goes in. Moreover, the proper person to accept responsibility is the engineer who orders the plant; and a really careful examination of the proposals put before him will save much subsequent effort to discover a scapegoat when it comes to determining who was the " somebody " who blundered.

Finally, let us end as we began. The business of the modern power station " is to produce a cheap and abundant supply of electricity." The way to do this is to install simple, well-tried, robust, and standardised plant, free from gadgets and all unnecessary trimmings, to give it a maximum accessibility, to run it easily, to tend it carefully—a high continuous efficiency is then assured.

High-pressure-steam Reciprocating Engines

THE high-pressure steam plant of the Philip Carey Co. at Lockland, O., came into operation last month. The steam conditions were: 1,800 lb. per sq. in. and 820 deg. F. The outstanding feature is the use of reciprocating engines of European make, which *Power* states have a better efficiency in this h.p. range and showed a lower guaranteed water rate than any of the steam turbines offered. The two engines, each of 6,060 h.p., are triple-expansion, 225-r.p.m. units, driving 4,700 kVA, 2,300-V alternators. Each engine has two vertical single-acting h.p. cylinders with pistons in tandem with, and opposed to two single-acting i.p. pistons. The l.p. piston is double-acting. Cylinder diameters are 14.25, 21.25, and 25.625 in., and the stroke is 25 in. The exhaust from the i.p. cylinders is reheated by live steam. Piston valves are employed, the lubrication is forced throughout and the crank-case is enclosed. Exhaust steam from the engine at 60 lb. per sq. in. goes to evaporators which supply process steam to the works. Each of the two boilers has a capacity of 150,000 lb. of steam per hr. and has a 40-in. diameter forged drum, 5 in. thick.

Mining Electrical Engineers' Convention

Meetings at Cardiff

THE annual Convention of the Association of Mining Electrical Engineers was held at Cardiff from June 10th to 12th, inclusive, when a full programme of business and social events was carried out by some 200 delegates and their friends from all parts of the country. On the Wednesday a party of 150 visited the Edison-Swan cable works at Lydbrook and the historic ruins of Tintern Abbey. A civic reception and dance followed in the evening at the City Hall, Cardiff, where the guests were received by the Lord Mayor (Alderman R. G. Hill Snook), the Lady Mayoress (Mrs. Gerard Geen), and the Association's president (Mr. J. W. Gibson). The visitors were the guests of the South Wales Branch at luncheon at Porthcawl on the Thursday, Major W. Roberts, branch chairman, presiding, after which a visit was paid to the National Oil Refineries at Llandancy.

The principal business of the Conference was transacted on the Friday, the Council meeting being held in the morning, followed by luncheon given by the Monmouthshire and South Wales Coal Owners' Association, the annual general meeting, and the annual dinner and dance.

Speaking at the luncheon, Sir John Brynon said that in common with all great industries they were suffering from the universal depression, but with the grit and determination which had ever marked the character of the sons of Gwent and Morgannwg they were determined to carry on.

Mr. J. W. Gibson referred to the increased demand for coal, which, unfortunately, was not benefiting this country in the least; in fact, Britain was down 10 per cent. on the total tonnage. A good deal of the remedy might be sought at home in the incidence of unfair taxation, high transport charges, and wages, when compared with Continental nations.

Responding to the toast of the Monmouthshire and South Wales Coal Owners' Association, proposed by Mr. Theodore Stretton, Mr. W. D. Wight (chairman of that Association) said the present high standard of living could not be continued upon the reduced production, and unless Britain was prepared to work harder and consume less foreign products the nation must pay the price of comparative poverty.

Major E. Ivor David (Cardiff) was elected president for the coming year. In his presidential address he said that twenty years ago, due to internal competition, the electrical industry was in much the same position as the mining industry was at the present time, but fortunately its directors were strong enough to call a halt and by the formation of price controlling rings, the development of co-operative research, and the promotion of trained engineers to managerial and directorial posts, the electrical industry had been able almost to eliminate foreign competition and to build up an export trade which was growing rapidly in value and importance. It would appear that the mining industry was producing efficiently, but it must also sell intelligently, and it was on this side that the least progress appeared to have been made. He believed the sales departments could make more use of the experience and engineering knowledge of the colliery staffs in dealing with customers who were well educated in the technics of their requirements. Coal was the cheapest form of fuel per B.th.u. produced in this country, and it was likely to remain so for many years, but in the Suez and Persian Gulf area and in the Gulf ports of America fuel oil could be purchased at about a dollar a barrel, and at that price the cost of oil per B.th.u. was less than that of coal. Any marine installation must be designed with this fact in view, and for that reason he believed that pulverised fuel burners in water tube steam generators with water walled combustion chambers of reasonable volume would be the solution of the mercantile marine steam production problem. Oil burners would be fitted to the same combustion chamber, and either fuel could be used with an efficiency at least 30 per cent. higher than that obtained with the present Scotch boiler, coal or oil fired.

The following officers were appointed:—Senior vice-president, Mr. F. Beckett, West Scotland; junior vice-president, Mr. R. Ainsworth, North Western branch. The treasurer, Mr. Roslyn Holiday, was re-elected.

Speaking at the annual dinner, Major David contended that to save money they had to spend. Let the colliery companies decide which mines they were going to develop and which they would abandon, and let them proceed now, not wait for improved trade, but anticipate it, be ready when it arrived, encourage it. Plant of all descriptions, especially electrical plant, would never be cheaper than it was to-day. Copper, tin, steel and iron were at bedrock prices. Manufacturers were starving for work and were prepared to grant facilities for finance and accept prices at factory costs to keep their staffs and workmen employed. Skilled engineers were available to prepare and carry out improvements, and capital was available at lower rates than at any time since the war.

Other speakers were Mr. W. D. Wight, Major W. Roberts, the Lord Mayor, Mr. C. A. Seyler (president, South Wales Institute of Engineers), and Mr. J. W. Gibson.

A hearty vote of thanks was accorded Mr. H. J. Nortron (hon. secretary of the South Wales Branch) and other local officials.

Parliamentary Notes

[By our Special Parliamentary Reporter]

The Weir Report

On June 10th, SIR PHILIP DAWSON asked the Minister of Transport what steps he intended to take in respect of the electrification of the railways, having regard to the view taken by the Weir Committee as to the amount of work which would be provided by it and the beneficial effect if would have on the distribution and the cost of electricity throughout the country; and whether he would take steps to induce the railway companies to take in hand immediately the electrification of the suburban services round our great cities and more especially round London, in view of the fact that the Royal Commission on Transport in 1905 recommended that course, and having regard to the success of the Southern Railway.

MR. PARKINSON, Under-Secretary to the Ministry of Transport, said that the Minister had asked the principal railway companies to consider the Report and to furnish him with their observations upon it as soon as they could. It would be remembered that the commercial success likely to result in certain circumstances from carrying out schemes of suburban electrification was one of the matters to which the Report referred.

Royal Assent

The Royal Assent was given to the following Bills last week: The Post Office and Telegraph (Money) Bill; the London Electric, Metropolitan District, and City and South London Railway Companies' Bill; and the Guildford Gas and Cranleigh Electricity Bill.

Overhead Lines in Yorkshire

On June 10th, MR. TURTON asked the Minister of Transport whether he had yet received the report of the conference held last April between the Central Electricity Board and the Scarborough District Joint Town-planning Committee regarding the proposed route of electrical "pylons" between Pickering and Whitby; and whether, in view of the protests from the inhabitants of the North Riding of Yorkshire, he would recommend the adoption of an alternative route that would not disfigure the natural beauty of the countryside.

MR. PARKINSON said that the Minister had not received any report of the conference mentioned, and the Central Electricity Board had not yet applied for his statutory consent to erect the overhead lines referred to. When that application was made he would consider the relevant matters.

Electricity Supply in Gloucester

On June 10th, MR. PERKINS asked the Minister of Transport whether he was aware that the village of Painswick, near Stroud, was not yet supplied with electricity by the West Gloucester Power Company; and whether he would draw the attention of the Electricity Commissioners to the need for this supply being given.

MR. PARKINSON said that the Minister was aware that the village of Painswick was not yet supplied with electricity. This had been the subject of correspondence and discussion between the Electricity Commissioners and the company, and he was informed that the company, as a result of a detailed inquiry, was of the opinion that the demand for electricity in this district was at present insufficient to ensure a revenue large enough to meet the cost of supply, &c., apart from any return on the capital required.

Rural Electrification in South Wales

On June 10th, MR. HOPKIN asked the Minister of Transport if he would expedite the preparation of a scheme for demonstration purposes for the electrification of the Vale of Towey; and what towns and villages it was proposed to include.

MR. PARKINSON said that the Electricity Commissioners were in communication with interested parties with regard to the preparation of a comprehensive scheme of electrification in a suitable district in South Wales. The development of such a scheme for the Vale of Towey presented certain difficulties since there was no existing undertaker authorised to supply electricity within the whole area of the Vale, but the possibility was being examined.

London Electricity Charges

On June 10th, MR. WEST asked the Minister of Transport if he would give the revenue per kWh of electricity sold for lighting and domestic purposes by the Notting Hill Electric Lighting Co., the South London Electric Supply Corporation, the South Metropolitan Co., and the Woolwich, St. Marylebone, and Wimbledon Borough Councils.

MR. PARKINSON said that the average revenue per kWh during 1929-30 for lighting and domestic supplies, including lighting of business premises, was over 4d. in the case of the first three undertakings referred to and under 2d. in the case of the last two.

Electricity in Modern Engineering

In the article under the above heading in our issue of June 5th, describing the electrical installation at the Chippenham works of the Westinghouse Brake & Saxby Signal Co., Ltd., the electrically-heated hydraulic "Bakelite" presses are referred to as made by John Shaw & Co., Ltd.; this should read John Shaw & Sons (Salford), Ltd.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The British Industries Fair

Your leading article of May 29th seems to me a very fair presentation of the problem, and I am quite sure you appreciate that no one who has had to do with the organisation of the Electrical Section in the past has any other desire than to do what is best in the interests of the Industry.

I am very glad to note your tribute of praise for the enterprise of the Birmingham Chamber of Commerce, who have not hesitated to put up a very large amount of money almost annually for the accommodation of the steadily increasing number of exhibitors who appreciate the value of the Fair. The Birmingham Corporation is also entitled to an acknowledgement in this connection for its consistent civic and financial support.

Wherever the Electrical Section, as such, may ultimately be located, there seems no doubt that a number of electrical manufacturers will be interested in both the London and Birmingham Sections. The interests of many are so closely interlocked with the engineering trades that they will continue to find it to their advantage to participate in the Birmingham Section.

This question of "allied" interests seems to me to go to the root of the matter. Taking the present allocation of trades between the two branches of the Fair, which the Chelmsford Committee, after hearing all views, recommended should stand, the Birmingham Section includes lighting plant, cooking stoves, general machinery of all descriptions, small tools, mining, colliery and quarrying plant, and metals of all descriptions. My opinion is that so long as this allocation of trades to Birmingham is maintained the great majority of electrical exhibitors will consider their best interests are served by remaining at Birmingham.

The Fair in its present appeal to industry generally, and so long as the present date remains unaltered, is, as you say, largely an appeal to the Home trade and comparatively little success has been achieved in attracting the Overseas buyers either to London or Birmingham.

Although a fair measure of success in the organisation of the Electrical Section has been achieved, I and those associated with me have been by no means satisfied. I have urged in season, and out of season, that trade organisations such as B.E.A.M.A. ought to have lent a helping hand from the beginning, but they have never been persuaded to do so. I am also strongly of opinion that it would considerably assist matters if the organisation were placed in the hands of a strong committee of leading electrical exhibitors. In this respect also I have failed to get any encouragement. This may be due to the fact that I do not represent any manufacturing interest, and I sometimes wonder why I have bothered, as I have for the past five years, to take a leading part in organising the Electrical Section. However, I am hopeful that your lead in this matter may bring forth some useful development, and that in the near future we may have an Electrical Section of the Fair worthy of our great industry.

E. J. JENNINGS,
Hon. Secretary
Birmingham, *June 13th*, 1931. *Electrical Section.*

Pole-line Insulation

Until the letter from H.J. was read this week, it was not my intention to reply to any remark on this subject.

In reply to Mr. Hutter, I would say that pole-line "all-wood" insulation is a very old practice—the very earliest practice. Several such like line-constructions were in pre-war days erected and operated by the writer in various parts of the American continent.

With respect to pole-switches, may it be mentioned here that the writer constructed and operated 60,000-volt wood-pole line-switches in California something like 26 years ago? And, in the ELECTRICAL REVIEW of May 5th, 1922, page 617, an e.h.t. steel-pole line-switch construction is shown which may be of some interest not only because of the practice but also because of the overhead continuous-earth-wire protection on each side of the pole—this illustration shows a little of the writer's work in Bolivia before the war.

In answer to H.J. of Peru, it should seem clear that as the continuous "earth" wire has become faulty the remaining earth attachment (stay wire) at the particular faulty insulator or insulators (pole or poles) can cause a drying-out or charring of the wood because of the current discharge due to a plurality of faulty insulators on the line-circuit concerned. Such a condition can arise with or without the bonding of insulator (metal) pins and/or earthing of the pole ironwork when and/or where uninsulated stay-wire attachments are used, or otherwise. Both (1) and (2) of H.J.'s remarks indicate weak or faulty insulation of the line. The bonding of insulator-pins, &c., up the pole does not correct this condition, but it generally decreases the chances of continuous operation, which is a more important requirement (in those countries) than a mere isolated case of charring of a pole top. May the writer again be allowed to add that in pre-war days he was engaged in Peru on the 50,000-volt hydro-electric development which operated a part of its transmission lines at over 16,000 feet altitude, and he is familiar with overhead distribution and transmission practices, and climatic and other conditions, in almost the whole American Continent?

London, N.2, *June 12th*, 1931. WILLIAM T. TAYLOR.

Mica Insulation

In regard to Mr. S. M. Mohr's letter in the ELECTRICAL REVIEW of June 5th regarding my short article on "Mica Insulation" which appeared in your issue of May 29th, Mr. Mohr, apparently, would have us believe that Canada, Argentina, and Brazil are not in America. America, so far as my article is concerned, includes also the U.S.A.

My statement that mica scrap is used in the production of micanite was made to show what happens to mica which cannot be readily split, and does not imply that *all* micanite is necessarily made from scrap mica.

It is interesting to note that Mr. Mohr's company has been making micanite since 1893. My article points out the general tendency to produce micanite substitutes, which are cheaper than micanite.

The statement *re* mica paper and cloth, in the last paragraph of Mr. Mohr's letter, is somewhat startling. To make this statement with accuracy, Mr. Mohr would have to be, in addition to his present position, the head of all other mica factories in the world.

Manchester, *June 11th*, 1931 A. E. WILLIAMS.

Transformer Oil

Transformer sales engineers are making a special point nowadays in advising prospective purchasers of transformer oil to accept Grade B instead of Grade A.

It will be of interest to have the views of transformer oil manufacturers on this important suggested change, as hitherto I have been informed that guarantees do not hold good for apparatus unless Grade A is used.

June 9th, 1931. INTERESTED ENGINEER.

The I.M.E.A. President and Company on the North Bay Railway

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. W. Simpson
Secretary of the I.M.E.A.

In the arrangement of a conference the bulk of the work falls upon the secretary of the organisation concerned, and success or failure depends largely upon the way in which this official carries out the plans. **Mr. J. W. Simpson,** the secretary of the I.M.E.A., can pride himself that his management of this year's Convention leaves no room for complaint. This is Mr. Simpson's third Convention, his appointment to his present position having been made in April, 1929. During his municipal service Mr. Simpson was for a time with the Bridlington Corporation. Consequently he knows the Convention neighbourhood, and this knowledge has doubtless been of great assistance to him on this occasion.

Mr. F. Swarbrick, borough electrical engineer of Basingstoke, was last week appointed electrical engineer and manager of the Hove electricity undertaking, in succession to the late Mr. C. B. Smith. The salary is £750 per annum rising by biennial increments of £50 to £1,000 per annum, with a motor-car allowance of £100 per annum. There were 171 applicants for the position.

The marriage took place at the Manchester Cathedral on June 3rd of **Mr. Philip Webb,** a member of the technical staff of the Manchester branch of the Swedish General Electric, Ltd.

Sir John Reith, Director-General of the B.B.C., received a medal from the Columbia Broadcasting System for his "distinguished contribution to radio art" in Chicago on June 9th and the ceremony was broadcast throughout the country.

Mr. F. N. Sutherland (English Electric Co., Ltd.), **Mr. J. H. Rogers** (Rio de Janeiro Tramway, Light, and Power Co., Ltd.), and **Mr. R. G. Walker** (Western Telegraph Co., Ltd.) were recently elected to the Council of the British Chamber of Commerce in Brazil.

Mr. Forbes Mackay, the general manager of the Sydney (N.S.W.) Electricity Department, has had his salary reduced from £3,000 to £2,250 per annum under an economy scheme instituted by the City Council. He has also been instructed to examine the duties of his staff and report, with a view to reductions in the salaries and numbers of the higher-paid officials.

Mr. Alan Dussek, managing director of the Dussek Bitumen Co., Ltd., and a son of the founder of that company, was married at Bromley on June 9th to Miss Murray.

Mr. P. J. Pybus, a director of the English Electric Co., Ltd., has been elected chairman of the Phœnix Assurance Co. Mr. Pybus has also been appointed a director of the Union Marine and General Insurance Co.

A happy group—Councillor Mrs. Gregory, Miss Dorothy Vaughan, Miss Gladys Sharp, and Mr. Ernest Sharp.

The E.A.W. at Glasgow

In our last two issues we have reported the proceedings at the second International Conference at Glasgow organised by the Electrical Association for Women. On this page we reproduce two photographs taken during the Conference in which some well-known members of the Association appear. The function provided pleasure and interest for a large number of delegates, and it may be anticipated that it will have a beneficial influence upon the progress of domestic electrification.

Miss C. Haslett, C.B.E., Mrs. Ll. B. Atkinson, and Miss R. F. Kennedy at the recent Glasgow Conference.

The Congleton Town Council has deferred for a year an application from the electrical engineer, **Mr. Pluck,** for the raising of his salary from £300 to £350 per annum.

Mr. W. H. Ashley, who was originally with Marconi's Wireless Telegraph Co., Ltd., London, and later deputy chief engineer with the Indian Radio Telegraph Co., Ltd., at that company's beam wireless station, Poona 6, India, has been appointed chief engineer to the company.

In Messrs. Hick, Hargreaves & Co.'s annual report it is mentioned that **Mr. J. G. Hudson,** a director of the company for 39 years, has retired on account of ill-health. He acted as chief engineer to the company for many years.

Mr. A. Hardy, who is on the staff of the Leicester Corporation Electricity Department, has been presented with a chiming clock by his colleagues on the occasion of his marriage.

Mr. W. H. Metcalfe, electrical engineer at Pontefract for eleven years, has been appointed electrical engineer of Bacup at a salary of £400 a year, rising to £450. He was associated with the Pontefract and Castleford tramway undertakings before taking up his present position.

At the first meeting of the new Committee of the Association of Consulting Engineers **Mr. S. C. Lewis,** M.Inst.C.E. (Messrs. Lewis & Lewis, Westminster), was unanimously elected chairman for the ensuing year. **Mr. A. H. Dykes** (Handcock & Dykes), and **Mr. S. R. Raffety** (Rofe & Raffety), were appointed joint honorary secretaries.

Col. A. S. Angwin, D.S.O., M.C., is the new chairman of the Wireless Section of the Institution of Electrical Engineers, and **Mr. L. B. Turner,** M.A., has been nominated vice-president.

Miss E. C. Morris has been appointed acting honorary secretary of the Cheltenham branch of the Electrical Association for Women in place of Miss D. Blaker, resigned.

Mr. C. L. E. Stewart, former borough electrical engineer of Rawtenstall, was recently entertained by the employers' side of the No. 3 North-Western District Joint Board and presented with a silver cigarette box upon his retirement from the Board.

Major H. Waymouth Prance, London manager of the Relay Automatic Telephone Co., Ltd., for the past nine years, has joined the staff of Radio Central Exchanges, Ltd., 37, Walbrook, E.C.4, as chief engineer and contract manager.

Obituary.—Mr. F. Newman.—Mr. Frank Newman, who passed away on June 11th at his home in Lewisham at the age of 71 years, was an outstanding link with the early pioneer days of electrical development. After commencing his career with the London, Brighton and South Coast Railway, he was engaged in 1884 by the late Dr. Ferranti under the Sir Coutts Lindsay Company, and later with the London Electric Supply Corporation, at the commencement of its operations at the Grosvenor Galleries installation. As engine driver and switchman in charge of the operating plant, he was associated with Dr. Ferranti and his colleagues in all his experimental work both there and at Deptford. He was the first man to switch an alternator into parallel, and the first to carry out switching operation at 10,000 V. Personally, he was a most genial character, with a wonderful store of humorous reminiscences of both the successes and the failures of those early days. He had the remarkable record of 41 years' service without absence through illness, until failing health led to his retirement five years ago.

Will.—The late **Mr. Thomas M. Farmiloe,** managing director of Messrs. George Farmiloe & Sons, Ltd., the lead manufacturers, left estate valued at £164,413 (£130,214 net personalty).

Mr. A. Chine, late of Streetly, electrical instrument maker, left estate valued at £12,781 (£11,638 net personalty).

Notes

Electricity Supply Statistics

The official returns rendered to the Electricity Commissioners show that 802 million kWh was generated by authorised undertakers in Great Britain during the month of May, 1931, as compared with the finally revised figure of 832 million kWh in the corresponding month of 1930, or a decrease of 3.6 per cent.

During the first five months of 1931 up to the end of May, the total amount of electricity generated by authorised undertakers was 4,854 million kWh, as compared with the finally revised figure of 4,712 million kWh for the corresponding period of 1930, representing an increase of 3 per cent.

A new volume of the Return of Engineering and Financial Statistics relating to Authorised Undertakers in Great Britain has been issued by the Electricity Commissioners. The publication covers the year ended March 31st, 1930 (or May 15th, 1930), for public authorities, and December 31st, 1929, for companies. It is obtainable from H.M. Stationery Office at 15s. net.

Faraday Celebration

On June 10th a conversazione was held at the Athenæum to celebrate the association of Michael Faraday with that club. He was its first secretary (in 1824). About 950 members and women guests were received by Lord and Lady Warrington, and Major-General Sir Frederick and Lady Maurice. Lord Warrington is chairman of the Committee of the Club, and Sir Frederick Maurice is chairman of the Executive Committee. Sir William Bragg, Director of the Faraday Laboratory at the Royal Institution, gave two short lectures during the evening, which were illustrated with lantern slides and reproductions of some of Faraday's experiments. Apparatus and other articles associated with Faraday were also on view.

Golf Competitions

As a result of the golf competition organised by the Mersey and North Wales (Liverpool) Centre of the I.E.E. a sum of £87 has been handed over to the I.E.E. Benevolent Fund as compared with £75 last year.

The fifth annual golf competition of the Liverpool and District Electro-Harmonic Society was held on the links of the Southport and Ainsdale Club on June 9th, when the principal event was the competition for the Allied Electrical Trades' gold challenge cup. There were 40 competitors, but the trophy was not won, Mr. E. G. Pulford, junr. (Pulford Bros., Ltd.) and Mr. T. W. Whyte (British Insulated Cables, Ltd.) finishing on level terms, each with a score of 72 net. They will re-play for the trophy at a later date.

I.E.E. Students' Outings

The South-Midland Students' Section of the Institution of Electrical Engineers will make a day trip to London on June 27th by train, when the Mount Pleasant station of the Post Office electric tube railway will be visited. On July 2nd there will be a day trip by motor coaches to the Rugby works of the British Thomson-Houston Co., Ltd. Luncheon will be taken at Willenhall in Warwickshire and tea at Leamington.

Fatalities

An inquest was held at Liverpool on June 9th on Sydney Atkin (15), who received a fatal electric shock while using a portable electrical fan blower for cleaning machinery at the works of his employers, Messrs. Samuel Stott & Co. In giving evidence, the foreman sawmiller said that part of the concrete floor was wet at the time of the accident. He did not know that there was a regulation that portable apparatus must be earthed when 150 V was used. Mr. S. Lowey, an official of the Corporation Electricity Department, said an examination of the apparatus showed that the insulation near the connector was defective. The manufacturers had put in a third wire for earthing, and had the Home Office regulation been complied with there would not have been a fatal accident. The jury returned a verdict of "Accidental death" and added a rider that in factories where there was electrical machinery there should be competent supervision, all apparatus should be compulsorily earthed, and that electrical apparatus should not be put on sale without full instructions as to its use.

An inquest was held recently at Bacup on John Green Parker (24), who received a fatal electric shock when repairing a hen run. The coroner stated that it was a real danger that, without any application to an engineer appointed by the authority supplying electricity, anybody could divert current from the mains by means of a plug and wire. The fence had become electrified owing to the insulation of a cable carrying electricity from a house to the hen runs having become worn by swinging against a stay wire.

In Dunfermline Sheriff Court on June 11th, an inquiry was held into the death of a linesman, David Cook Galloway, Kelty, who was killed by an electric shock from one of the transmission lines at No. 10 colliery, Kirkford, belonging to the Fife Coal Co., Ltd. A fellow workman, who accompanied Galloway, said he told him that the pole was one of the Mossbeath poles and that the wires were "alive." Galloway, however, said he knew it was another circuit such as they had already examined, and he thought it safe. Galloway climbed the ladder until he reached the cables. Witness said he saw sparks flying, and immediately ran to switch off the circuit about 100 yards distant, but by that time Galloway had fallen down. The Procurator Fiscal remarked that Galloway was killed through his own mistake, thinking this was the Kirkford pole instead of a No. 7 colliery pole, and witness concurred. Witness also agreed that it could have been seen whether they were right or wrong by proceeding to the panel, about 100 yards distant. A formal verdict was returned.

University Electrical Engineers' Association

At the annual general meeting of the Association of University Electrical Engineers in University College, Dublin, I.F.S., Mr. Patrick Harkin, engineer-in-charge under the Electricity Supply Board in the Dublin area, was elected president for the ensuing year. Dr. T. MacLaughlin and Mr. P. J. Tierney were elected vice-presidents; Mr. M. Kealy as secretary; and Mr. P. J. Byrne as treasurer. The committee elected was: Messrs. P. McGahan, P. J. Corr, W. Halm, E. V. Starkey, and P. McDonald.

The Electrical Association for Women

On June 11th members of the Birmingham and Midlands Branch of the Association spent an interesting afternoon at the Frankley Works and Bartley Reservoir of the City of Birmingham Water Supply Department.

To Avoid Explosions

It is stated that on the assumption that gas and electricity can exist peacefully side by side, the German Association of Gas and Water Engineers and the Union of German Electricity Works have agreed to refrain from mutual attacks, indirectly or directly, in their propaganda, and to exercise their influence in the same direction on the organisations which are closely associated with them! There are not even to be competitive exhibitions—so they say!

French "Cheaper Electricity" Campaign

For the past four years the association known as the Groupement des Consommateurs d'Electricité de la Gironde, of Bordeaux, has been pressing the French Ministry of Public Works to revise the existing rules on which electricity prices are based in France. The Association, working alone, having so far not been able to achieve any result, has lately issued an appeal urging all associations of electricity consumers, Chambers of Commerce, and other bodies throughout the country to join in a national appeal for Government action. In its appeal the Gironde Association states that, generally, the prices chargeable per kWh are given by the formulæ:— Price $= A + n\ (I - 130)$ for low-voltage supply and price $= A + n\ (I - 100)$ for high-voltage supply, in which A represents the basic kWh price, which varies in nearly every case, it being under no official control; n is a coefficient fixed by the Ministry and inserted in the concession, its value being, however, in no way uniform (its purpose is to ensure that the supply undertaking shall be in a position to cover its capital charges and the costs of running and maintenance); I represents an economic index, which is fixed every six months by the Electricity Distribution Committee of the Ministry of Public Works, theoretically composed of representatives of the Ministry, the supply undertakings, and the consumers. In practice the Committee is dominated by representatives of the undertakers. The economic index figure is based on the local cost of coal and the average hourly wage rate, compared with the average wage in 1918. The Gironde Association maintains that under existing regulations consumers are practically in the hands of monopolists, as a result of which electricity distributing concerns are all prospering while all other branches of industry are passing through a serious trade depression. It urges that there should be a nation-wide effort on the part of consumers to secure proper representation on the Ministry's Electricity Committee, revision of the method of calculating the economic index figure and of the coefficient n, and a careful inquiry into the economic index figure of hydro-electric undertakings, which at present is on a similar basis to those using coal, and, finally, regular official publication of the economic index figures and of the different factors on which such figures are worked out.

Institution of Civil Engineers

The annual conversazione of the Institution of Civil Engineers took place at the London headquarters on June 10th. The customary display of exhibits included an 8-kW glass mercury-arc rectifier shown by Mr. J. L. North. The Post Office had a model of a "T.W." beam aerial arranged as used for short-wave directional radio-telephony transmission, and also demonstrated the effect of distortion on speech reproduction by means of an electric gramophone and filters inserted to cut off various bands of the frequency spectrum.

The National Physical Laboratory demonstrated 1.5-metre radio-telegraphy, and showed apparatus used in studying the electrical constants of the ground for ultra-short electrical waves, and photographs illustrating the applications of X-ray crystal analysis to industrial problems. Methods of measuring noise were illustrated, and of rendering air-flow visible by means of electrically-heated wires whose shadows were projected on to a screen. There was also on view a standard resistance of 0.00002 ohm which has been used to determine the effect of current distribution on potential drop. It consisted of 40 manganin tubes, 15 mm. in diameter, connected in parallel

to copper discs, the tubes being water cooled and satisfactory up to 20,000 amperes.

Mr. John L. Hodgson exhibited apparatus designed to indicate and record electrically at a distance the very low air velocities which occur in the upcast shafts of the Victoria Tunnel, Wellington, N.Z. It consisted of a balance arm carrying an impact plate, the movements of which were controlled by a pendulum weight which, in moving, altered the resistance of an electrical circuit to which an arm carried by the beam was connected. The resistance was in a gastight box so as to be unaffected by corrosive gases in the air. Change of resistance due to movements of the beam will cause the air velocity to be indicated and recorded electrically in the ventilation control room situated about a mile away from the outlet of the upcast shaft.

Another of Mr. Hodgson's exhibits was of the electrically operated thermo-couple potentiometer type, capable of measuring, recording, and maintaining industrial temperatures. The 10-in. wide chart covered a range of 200 deg. F. and accurate control may be obtained to within plus or minus 1 deg. at 1,000 deg. F. The galvanometer and the operating mechanism were in a gastight case and when necessary all parts carrying high-voltage can be protected or fitted with flameproof casings.

The "Kent" automatic temperature controller is designed to take into account both the actual plus or minus deviation from the standard temperature and also the plus or minus rate of deviation. It is quick in response and eliminates hunting. A new form of instantaneously acting mechanical clutch has been developed; it consists of a continuously rotating high-speed shaft carrying worms into gear with which left- and right-handed worm wheels are thrown by the action of electrically-operated solenoids. This novel gear works without noise or wear and permits of precision operation.

Mr. W. H. Owen showed an air-preheater made up of steel plate cells closed by welding along the edges, except where openings are left for the entry and exit of the air. The cells are arranged side by side, so that the air flows through the cells and the waste gases through the spaces left between them. The cells are assembled in bundles of elements, each element being enclosed in a rigid angle-iron frame into which the cells are permanently welded. Bolts, provided with distance pieces, pass through the elements to ensure accurate spacing. The edges of the openings in the cells are also so welded together that air cannot pass into the gas spaces, the whole forming an air-tight and rigid structure. The elements are assembled in a mild-steel casing which forms a portion of the flue and does not require to be dismantled for the purpose of removing the heating surface. This is a most important feature of the "Carrier-Owen" preheater and the whole operation of inserting the element and making a good joint occupies only a few minutes.

4,000 kWh per Domestic Consumer

Winnipeg, Canada, has frequently been cited as having 55 per cent. saturation in electric cookers and 40 per cent. in water heaters. Some of the conditions contributing to this situation are related in the *Electrical World*. The average domestic consumption of 4,000 kWh can be attributed chiefly to four factors:—

(1) The citizens have a distinctly pioneer disposition or eagerness to adopt new methods and buy new things because they live in a relatively new territory and are not weighted down with traditional physical impediments or old habits that must be shed.

(2) Sources of fuel—coal, oil, and gas—are relatively remote, so they create little competition with electric service.

(3) Low rates are made possible by the relatively inexpensive base-load hydro-electric plants with surplus water supply, short transmission lines, absence of expensive system refinements required to give the service continuity demanded elsewhere, and large energy usage per consumer.

(4) Extensive public acceptance has been manifested in ample house-wiring facilities and outlets, as typified by the wide use of "Red Seal" homes averaging 75 outlets per home. More than half of all new dwellings are awarded "Red Seal" certificates.

Large Stores' Electricity Consumption

In connection with the 75th anniversary of Lewis's, Ltd., the well-known store proprietors of Liverpool, Manchester, and Birmingham, an interesting announcement has been made concerning the company's consumption of electricity. The consumption in the last twelve months was 7,994,625 kWh, as compared with 3¼ million kWh in 1925.

Ticket-issuing Machines

The London & North-Eastern Railway Co. has installed electrically-operated ticket-printing and issuing machines at Newcastle-on-Tyne station. They are of the A.E.G. type; one is of the coin-in-the-slot class and the other is capable of issuing tickets to 2,500 destination stations.

Appointments Vacant

Station superintendent for Plymouth Electricity Department.

Temporary general assistant engineer for Basingstoke Corporation.

Attendant at water pumping station for Newbury Corporation.

Meter tester for Portsmouth Electricity Department.

Lady showroom assistant and demonstrator for Walsall Electric Supply Department.

Shift charge engineer for Hackney Borough Council.

Junior shift engineer for Dorchester Electricity Department.

(See our advertisement pages to-day.)

Earth Currents

At a meeting of the Royal Society of Edinburgh held recently a communication was submitted on "The Electric Field in Terrestrial Magnetic Storms," by Mr. A. H. R. Goldie, superintendent of the Meteorological Office, Air Ministry, Edinburgh. Using mainly the data of Lerwick, Eskdalemuir, and Abinger observatories, computations were made of the position, direction, and strength of electric currents capable of producing the displacements recorded during storms. A chart was shown of the electric current system in northern latitudes; it was shown to be derivable from currents generated mainly in the illuminated regions of the globe with the difference on disturbed days, as compared with the quiet days, that the currents emanating from those regions required to be multiplied by a factor of the order of from two to five. It was further concluded that the generation, by dynamo action, of electric fields sufficient to account for the diurnal variations of magnetic force was not inconsistent with new knowledge acquired by radio research on the higher conducting atmosphere. A certain region in the current system was characterised by the discharge of electric current, and this appeared to be the same as the region of maximum frequency of aurora.

The E.L.M.A. Stand at the Scarborough Convention Exhibition

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

"Electrical Review" Index

The Index to Vol. CVIII (for the half-year ending June 30th, 1931) is in course of preparation and will be published shortly. We shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes, or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.4.

The White City

We have received copies of privately-circulated particulars concerning the proposed formation of companies for the purpose of reopening the White City at Shepherd's Bush as a permanent exhibition centre. The purchase price for the land and buildings (82½ acres) is put down at £1,000,000; 7 acres would be leased at an annual rental of £140,000 for exhibitions, carnivals, amusement park, and other purposes, and 12½ acres as building plots. It is estimated that it will take eight months to recondition the existing buildings and carry out other necessary work. The documents refer to a proposed Franco-British Exhibition from May to September, 1932, similar to that of 1908.

Petters' Activities

During the coming week Messrs. PETTERS, LTD., will be taking an active part in two exhibitions. At the Highland Show, which is being held in Edinburgh, will be shown a representative selection of the company's oil engines and electric generating sets, together with other combination plant in capacities of upwards of 1½ h.p. These models include engines of 5, 12, and 18 b.h.p. of the vertical surface ignition or hot-bulb, cold-starting type, as well as the 40-b.h.p. single-cylinder atomic Diesel engine, which possesses a number of interesting features and is one of the company's latest products. The other exhibition at which the company will be represented is that held in connection with the Cinematograph Exhibitors Association's Summer Conference at Brighton. Here will be demonstrated one of the "Petter" generating sets designed especially for use in kinemas. This is of 8-kW capacity and comprises a 12-b.h.p. surface-ignition engine coupled to a dynamo, the whole being mounted on a cast-iron baseplate.

An Electrical Code

The United States National Electrical Manufacturers' Association has sent us particulars of a telegraphic code which has been compiled by a joint committee of the American electrical industry composed of representatives of the manufacturers, contractors, retailers, the National Electric Light Association, wholesalers, radio traders, and the Society for Electrical Development. This is claimed to be the first instance of an entire industry uniting in evolving a general code. The code has been termed the "Lcode," and it is said that by using it a saving of from 40 to 70 per cent. can be effected in telegraphic communications. About 50,000 five-letter code-words have been allotted to general business phrases and technical terms. A tabular section includes code-words for motor ratings, &c. It is proposed to issue every six months a list of holders of the code.

The F.B.I. Canadian Mission

The Federation of British Industries has published the report of the Mission which recently went to Canada under its auspices. This Mission, of which Sir James Lithgow, Sir Arthur Duckham, and Mr. Moir Mackenzie were members, visited the principal centres of the Dominion and interviewed many of the political leaders and Canadian industrialists. They found that parallel with a determination to produce as much of their requirements as possible in Canada, there was a strong feeling among Canadians of fellowship with Great Britain and a desire to strengthen inter-Empire trading relations. The proximity of the United States has led to a species of "Americanisation" of the people, while the investment of American capital in the country has given the United States a dominant position in Canadian industry. Against this, trade with Great Britain has to meet the handicap of distance and difficulty of communication. British trade has also been adversely affected by inadequate representation, the inelasticity of tariff and dumping regulations, and the lack of joint economic study between the Dominion and Great Britain. The conclusions arrived at by the Mission may be briefly summarised as follows:—A change in Great Britain's fiscal system appears to be necessary if reciprocal trade between the units of the Empire is to be attained; the development of British trade must be on the lines of the acquisition of business at present in foreign hands, the development of new lines, and the assistance of existing Canadian industries rather than competition with them; closer commercial and industrial association between the two countries will result in an improvement of the preferential position already enjoyed by Great Britain; co-operation between home producers is essential to build up a selling and a service force in Canada capable of meeting foreign competition; many complaints of bad delivery and service are justified and can only be remedied by closer contact with the customers and their requirements; prospective traders should make the closest study of transit conditions, tariff regulations, &c.; greater use should be made of the services of the Trade Commissioners; communications (especially telephonic) should be made easier, and, if necessary, subsidised; uniformity of Empire trade statistics is essential; Empire units should set up economic investigatory committees which should be in close touch; and the British Press should exploit every opportunity to uphold and strengthen British prestige, and so stimulate and support British industry and trade throughout the world. The opinion is expressed that the F.B.I. could assist these objects by bringing trade groups together to study Canadian conditions; by encouraging the sending of suitable representatives to Canada to discuss with Canadian manufacturers plans for complementary production in the two countries; and by joining with other interested organisations in the setting up of joint committees to study Empire trade continuously.

United States Electrical Exports

During March last electrical equipment to the value of $3,271,203 was exported from the United States; this represented a decrease of $4,758,789 in comparison with March, 1930. The total for the first quarter of the year showed a decline from $37,174,793 to $23,473,990. The principal decreases in March occurred in the following items: A.c. generators, from $162,265 to $12,905; batteries, from $700,405 to $502,090; transforming and converting apparatus, from $830,438 to $334,779; power switches and circuit-breakers (over 10A), from $299,801 to $81,290; stationary motors, from $692,927 to $307,305; accessories and parts of motors, from $253,850 to $106,240; self-contained lighting outfits, from $100,292 to $19,779; industrial furnaces, ovens, &c., from $149,324 to $35,520; telephone apparatus, from $746,484 to $247,346; carbons and electrodes, from $263,656 to $151,684; bare copper wire, from $649,888 to $88,115; and insulated wire and cable, from $502,567 to $268,969. The only increases of any magnitude occurred in the cases of switchboard panels (from $162,177 to $324,291) and radio apparatus (from $1,327,658 to $1,546,288). Canada, the principal importer of American electrical equipment, accounted for $2,072,016. The United Kingdom ($709,581) took second place and other important customers were Mexico ($537,364—largely motors), Chile ($507,199—mainly switchboard panels), and Argentina ($444,719—showing a fall of $224,556). Imports of this class into the United States during March increased by $112,684 to $293,875, lamps and vacuum cleaners being the principal items; the latter were practically all from Sweden.

Industrial Purchasing

Representatives of over a hundred leading industrial companies met in London recently to consider the problems of industrial purchasing. The conference was organised by the Industrial Welfare Society, and the chairman was Mr. R. Pugh. Among the concerns represented were the Park Royal Engineering Co., Ltd.; Pye Radio, Ltd.; the Chloride Electrical Storage Co., Ltd.; Hans Renold, Ltd.; the Metropolitan-Vickers Electrical Co., Ltd.; John I. Thornycroft and Co., Ltd.; and the English Electric Co., Ltd. Among the subjects discussed were the functions and knowledge of a purchasing agent; Russian and German competition; the necessity for modernising plant; and the fall in commodity prices. In a lecture, Mr. L. H. Swinbank, controller of purchases, Imperial Chemical Industries, summed up the purposes of the conference in the following sentence:—"When it is considered that nearly 60 per cent. of the total costs of production represents materials, it will be realised that the purchasing function has a vital bearing on factory costs, and that profit-making in highly competitive industries depends very largely on economical buying."

Registered Electrical Contractors

Applications for registration from the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

Gardner, H. W., Cheadle, Ches.
Tucker, J., Newport, Salop.
McAuley, McIlroy, Ltd., Belfast.
Electra (Birmingham), Ltd., Birmingham.
France, J. W. & Co., Manchester.
Blackett, E. S., Haughton-le-Skerne, Darlington.
Hornsby, A. E., & Co., Gillingham.
Alfred White Electrical Co. (1931), Ltd., Sunderland.
Smith, W. H., & Co., Manchester.
Prestwich, V. R., Middleton, Manchester.
Shepherd, C. T., Lower Broughton, Salford.
Bennett, L., Stockport.
Weaver, H. R., Stafford.

At the same meeting two applications were withdrawn and nine were declined.

A Motor Sales Conference

On June 4th and 5th, the whole of the United Kingdom representatives of the Lancashire Dynamo and Motor Co., Ltd., and the Crypto Electrical Co., Ltd., assembled at the Trafford Park works for their annual sales conference. The proceedings commenced with lunch at the works, after which Mr. H. W. Bosworth, joint managing director, addressed the conference. His remarks on the commercial and financial position of the companies were most encouraging. He said that both the Willesden and Trafford Park works had introduced several new types of machines during the past two years. The trading results during that period had been very satisfactory, with the result that the joint companies were now in a very strong financial position. The afternoon of June 5th was devoted to an inspection tour of the Trafford Park works, which included the exhibition of special products from Willesden. The tour concluded with the display of a film showing various manufacturing processes. In the evening the representatives dined at the Engineers' Club, Manchester. On June 5th papers were read by several members of the staff and discussed. We reproduce above a photograph taken during the conference.

"Lancashire" and "Crypto" Sales Representatives

Power Station Staff Salaries

In our issue of May 22nd (p. 858) we referred to the probable institution of a new schedule of salaries for engineers employed in power stations at the end of this month, and suggested that the rates then put forward would be lower than the present ones. Mr. J. W. Thomas, who contributes an article to this issue, suggests that this may give rise to some doubt in the minds of those concerned. What we intended to convey was that as these salaries are on a "cost-of-living" basis and as the official index has shown a continued fall during the past year, the new rates, if calculated on the same basis as heretofore, would probably show a downward movement. The schedule as it stands at present was fixed last year at the level then existing for a period of six months and was then extended for another six months—a period which expires at the end of June.

Overseas Electrical Trade during May

The Board of Trade returns for our imports and exports during May show that the value of electrical goods and apparatus exported was £622,275, while electrical machinery exports amounted to £318,985. The total of £941,260 compares with £1,618,320 in May, 1930. Imports of electrical goods and apparatus were valued at £375,906 and electrical machinery imports at £143,669, making a total of £519,575, as compared with £704,290 in May last year.

Great Britain's Radio Exports

According to the *Wireless and Gramophone Trader*, the total value of radio apparatus exported from this country during April was £82,676 (excluding re-exports) made up as follows:—Valves, £35,390; receivers (excluding valves), £5,855; transmitting apparatus (excluding valves), £18,974; electrical and radio gramophones, £5,724; and other parts and accessories, £26,733. The principal customers for valves were Argentina and Australia; for receivers, the Irish Free State, Arabia and South-West Africa; for transmitters, Arabia and Italy; for electrical and radio-gramophones, Belgium and Switzerland; and for other parts and accessories, Italy, India and South Africa.

Patent Restorations

An Order was made on June 9th restoring Letters Patent No. 429,728 granted to T. Varney, entitled "Method of and apparatus for protecting aerial cables," and No. 261,442, granted to T. Varney and another, entitled "Improvements in fittings for composite electric cables and method of applying same."

Book Notices

"Faraday House Journal," Vol. XIV, No. 3, Summer Term.—Containing news, notices, and notes; photographs of the Rugby and hockey teams and an announcement that the governors of the college have purchased "The Grove," West Molesey, as a sports ground.

The Revised Heat Drop Tables (1931): H.P., 100 to 3,200 lb./sq. in gauge; L.P., 14 to 19 lb./sq. in. abs.—Calculated by Herbert Moss, D.Sc., A.R.C.S., from the new data and formulæ of the late Prof. H. L. Callendar, C.B.E., M.A. Published for the British Electrical and Allied Industries Research Association. London: Edward Arnold & Co.

"Electric Motor Management," by Alfred H. Avery. Pp. 146; figs. 103. London: Percival Marshall & Co., Ltd. Price 3s. 6d. net.

The Association of Supervising Electrical Engineers.—A brochure published by the Association giving in concise form information regarding its activities, &c.

"Verstösse Gegen Sicherheit und Zweckmassigkeit Elektrischer Anlagen und über Deren Bekampfung," by Ing. Gustav W. Meyer. 50 pp. Boddenbach-A.-Elbe. Czecho-Slovakia: Meyer's Technische Verlag. 2.40 Rm. (about 2s. 4d.).—This little book, printed in German, is intended for the use of both electrical installation contractors and users of electricity. A free translation of its title may be given as "Faults in the Safety and Suitability of Electrical Installations and How they May be Overcome," and some idea of the scope and purpose of the work may be gathered from the following mention of some of the more important short chapters. Following an introduction, the author deals with the ways in which electricity can give rise to fires, the ominous short-circuit, and the necessity for frequent inspection of switchgear and transformers. In a second section attention is drawn to electric motors, and the need for keeping them clean and the attention that should be given to the various components. Lighting installations are similarly dealt with, emphasis being laid on the need for correct wiring and properly-made connections, while in the later pages references are made to radio installations, h.p. plants, the need for the provision of protection against accidents, lightning conductors, &c.

A Contract Correction

In the "Contracts Open" section of our last issue we included an item under the heading "Epsom," which, in fact, related to stores which the Urban District Council has for disposal.

A Floodlighted Power Station

A number of electricity supply authorities have adopted floodlighting of their power stations as a means of attracting attention to their service. The method is very effective and no doubt creates a good impression in the minds of the public. The latest undertaking to install floodlighting is the Clyde Valley Electrical Power Co., a night view of whose Yoker power station accompanies this note.

The Yoker Power Station

Prices of Materials

Messrs. James Forster & Co. state that lead prices showed an upward tendency last week, but this is attributed almost entirely to sentiment, the consumers' demand remaining very quiet. If advances are to be maintained a better consuming demand than the present will be necessary.

Messrs. Edward Till & Co. report, June 16th: India-rubber, Para fine, no change.

Messrs. James & Shakespeare report, June 16th: Copper bars (best selected), sheet and rod, no change. English pig lead, £12 10s., 5s. inc.

New Australian Companies

Among the companies recently registered in Sydney (N.S.W.) are the following: The Australian Battery Corporation, Ltd., to merge the U.S.L. Battery Corporation (Australia), Ltd., and Sterling Batteries, Ltd.; Norman Whyte, Ltd., capital £50,000, to carry on the business of electrical engineers, manufacturers of, and dealers in, electrical and radio goods, &c.; Neon Signs (Australasia), Ltd., nominal capital £2,000, to manufacture and distribute neon and other advertising signs; and the Mullard Radio Co. (Australia), Ltd., nominal capital £5,000, to carry on the business of manufacturers and sellers of all kinds of radio apparatus.

A T.D.A. Poster

Telephone Development

Last week an intensive "campaign" was opened by the General Post Office and the Telephone Development Association working in co-operation, and we reproduce with this note a photograph of a large poster designed especially for the occasion. Mr. H. E. Powell-Jones, director of the Telephone Development Association, is standing by the poster, and thus affords an indication of its size. The Postmaster-General recently announced that about £32,000,000 was to be spent on the telephone service within the next three years, so that there is ample scope for the Post Office and manufacturers in this field.

At the end of the last financial year (March 31st) the total number of telephones in Great Britain was 1,982,171, of which 712,493 were in London. The United States, with three times the population, has eleven times the number of telephones—22,000,000. And nine other countries, including Canada, Sweden, and Germany, have a higher ratio of telephones to population than Great Britain.

Swiss Electrical Exports

The exports of electrical machinery and apparatus from Switzerland during the three months ended with March last attained a value of £805,840, as compared with £920,320 in the corresponding quarter of 1930.

Trade with Central America

A memorandum dealing with the general conditions governing tenders for Government contracts in Costa Rica and El Salvador, prepared from information furnished by the British Consuls at San José and San Salvador, has been issued by the Department of Overseas Trade to firms whose names are entered on its Special Register. British firms desirous of obtaining a copy of this memorandum should apply to the Department, 35, Old Queen Street, S.W.1. Reference number C.X. 3568 should be quoted.

A Canadian Power Investigation

The Ottawa correspondent of *The Times* reports that the Dominion Government has announced the *personnel* and terms of reference of the committee which will investigate the activities of the Beauharnois Light, Heat, and Power Corporation. The committee will consist of nine members, including the Progressive leader, Mr. Robert Gardiner, whose charges of misrepresentation, fraud, and improper dealings, made against the Corporation in Parliament recently, were responsible for the inquiry. The committee is instructed to investigate from its inception the Beauharnois project (for the development of hydro-electric energy by the use of the waters of the St. Lawrence), so far as the matters referred to are within the jurisdiction of the Dominion Parliament, and particularly to inquire into the questions raised by Mr. Gardiner.

Czecho-Slovakian Electrical Imports

Electrical machinery and apparatus to the value of 21,812,000 crowns (£133,000) were imported into Czecho-Slovakia during April, making the total for the first four months of this year 92,291,000 cr. (£563,000).

Polish Foreign Electrical Trade

During March last conductors, apparatus, and other electrotechnical materials valued at 4,268,000 zloty (£98,600) were imported by Poland. Polish exports of this class were valued at 184,000 zloty (£4,200).

The Chinese Machinery Market

In the course of a recent report upon the trade situation at Shanghai, the Commercial Counsellor in that city states that there are many inquiries in the machinery market, but difficulties almost invariably arise with regard to the terms of payment. The high cost of machinery owing to the unfavourable exchange has led to the postponement of a good many projects. There can, however, be no doubt that the industrial development of China is making steady progress and if political conditions remain reasonably stable the demand for machinery should expand very rapidly.

"A noteworthy feature in the machinery business has been the strong efforts now being made by Japanese manufacturers to compete not only for the low-quality trade in which they have long been formidable, but also for the supply of equipment of a better type. There have, for example, been recent instances in which substantial orders for electrical supplies have been placed in Japan by the Shanghai Power Co., and whilst the Japanese tenders have been in some cases less than half those quoted by American and Continental manufacturers one is entitled to assume that they would not have been accepted unless they were fully in accordance with the specifications. It is difficult to believe that such contracts can be remunerative, but they are at least evidence of the determination of the Japanese machinery manufacturers to establish their position in the market."

National Display Convention

The seventh annual convention of the National Display Association is to be held at Portsmouth from August 31st to September 2nd.

The "Exide" Convention

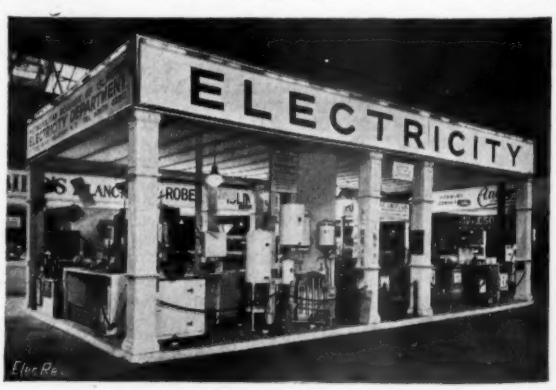
The annual convention of "Exide" battery service agents was held at Bournemouth this week, and representatives from all parts of the world were present. A banquet was held at the Pavilion on Wednesday evening, and Mr. G. M. Gillett, Parliamentary Secretary to the Department of Overseas Trade, was to be the principal speaker.

Electrical Demonstrations at Manchester

With the object of encouraging electricity consumers to employ such appliances as electric furnaces, welders, canteen cookers, &c., the old stores of the Manchester Corporation Electricity Department at Dickinson Street are being used as a demonstration room, where manufacturers are given the opportunity of demonstrating suitable apparatus before interested persons. A series of demonstrations is also being given in the Church Room, Northenden, this week in order to stimulate the demand for domestic appliances, particularly for electric cooking, in and around the Northenden district. A similar demonstration will be given later at New Morton (North Manchester).

The Islington Trades Exhibition

A very prominent position was taken by the stand of the Corporation Electricity Department at the Islington Civic Week and Trades Exhibition which was held at the Royal Agricultural Hall last week. The Electricity Department was assisted in the organisation of its exhibits by the British Electrical Development Association and the result obtained was both comprehensive and attractive in appearance. The stand, an illustration of which accompanies this note, was one of the largest in the exhibition and occupied a very conspicuous position in the centre of the hall. Throughout the week demonstrations were given of cookers, water heaters, vacuum cleaners, and other domestic appliances, and in addition, there was a large display of lighting fittings, fires, small domestic appliances, wash boilers, &c. The following manufacturers co-operated in the exhibit:—Messrs. Bastian & Allen, Ltd.; Belling & Co.; Berry's Electric, Ltd.; the British Electric Transformer Co., Ltd.; the British Vacuum Cleaner & Engineering Co., Ltd.; Credenda Conduits,



The Islington Electricity Department's Stand

Co., Ltd.; the Edison Swan Electric Co., Ltd.; Electric Fires, Ltd.; Electrolux, Ltd.; the General Electric Co., Ltd.; the Jackson Electric Stove Co., Ltd.; Santon, Ltd.; Wild-Barfield Electric Furnaces, Ltd.; the Vidal Engineering Co., Ltd.; and Young, Osmond & Young. At a separate stand the Vidal Engineering Co., Ltd., was demonstrating for the first time the new "Kent" electric washing-up machine, by means of which the whole of the table requisites of an average family can be washed, rinsed and dried, without danger of breakage, within three or four minutes. Among other electrical exhibitors were Messrs. A. C. Cossor, Ltd., the Ever Ready Co. (Great Britain), Ltd., and the Scott Insulated Wire Co., Ltd.

New Catalogues and Lists

SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham.—A folder containing particulars and prices of "S.E.S." switches, switch-fuses, and distribution boards.

RADIO INSTRUMENTS, LTD., Madrigal Works, Purley Way, Croydon.—A booklet giving details of the "Parafeed" l.f. transformer.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2.—A leaflet dealing with a new "Philips" 25-watt amplifier for use with public address and music amplifying equipment.

FERRANTI, LTD., Hollinwood, Lancs.—Leaflet W.517, describing "Ferranti" rejectors for eliminating or reducing the strength of unwanted broadcast programmes; also an illustrated catalogue, giving full particulars of "Ferranti" water heaters.

The BRITISH ELECTRIC TRANSFORMER CO., LTD., Wellington House, Strand, London, W.C.2.—An illustrated leaflet giving full specifications of the new "Tricity" cooker, "No. 800."

The VISCO ENGINEERING CO., LTD., 162, Grosvenor Road, London, S.W.1.—Catalogue No. 312, illustrating and describing the "Visco" method of dust collection.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—A leaflet relating to "Brook" motors.

The PULSOMETER ENGINEERING CO., LTD., Nine Elms Iron Works, Reading.—A revised catalogue (No. O.618) of "Pulsometer" turbine centrifugal pumps.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, E.C.1.—A 58-page catalogue (W.A.1) of "Henley" unit-type distribution pillars and panels; also a leaflet relating to "Isco" cut-outs.

VERITYS, LTD., Aston, Birmingham.—Pamphlet No. 1,093, giving particulars of the company's flameproof electric fans which have been designed for use in places where explosions are liable to occur.

The SUN ELECTRICAL CO., LTD., 118 and 120, Charing Cross Road, London, W.C.2.—An illustrated leaflet regarding the "Capehart" automatic record changer and a folder dealing with the "Sunairo" and "Primo" fans, together with details of revised prices of fans and certain "Sunco" domestic appliances.

L. G. HAWKINS & CO., LTD., 30/35, Drury Lane, London, W.C.2.—The June issue of the "Link" containing details of the new "Nektie" electric tie iron.

BALDWINS, LTD., Wilden Ironworks, near Stourport.—A booklet giving technical information with regard to the company's sheet steel for laminated magnetic circuits of electric motors, generators, transformers, and other electrical apparatus.

HEYES & CO., LTD., Water-Heyes Electrical Works, Wigan.—The June issue of the "Wigan Review," containing details of the "Wigan" prismatic bulkhead fittings.

The EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, London, E.C.4.—Publications H.C. 678, H.C. 684, and A. 677, dealing respectively with "Ediswan" wash boilers, exhaust fans, and a new moulded suspension switch.

G. & J. WEIR, Cathcart, Glasgow.—Publication No. 33, describing "Weir" regenerative condensers. Particulars and illustrations are given of the turbine installation for s.s. *Empress of Japan*, which includes this type of condenser.

The JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1.—A leaflet illustrating and describing a new range of "Jackson" electric cookers.

BRUCE PEEBLES & CO., LTD., Edinburgh.—Pamphlet No. 25, dealing with a complete range of small and medium-sized squirrel-cage and slip-ring induction motors.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.4.—Leaflet No. 1012, relating to "Igranic" automatic motor starters.

GEORGE ELLISON, LTD., Perry Barr, Birmingham.—Pamphlet No. 121, illustrating and describing oil-break star-delta starters for squirrel-cage induction motors.

SADIA, LTD., 22, Newman Street, Oxford Street, London, W.1.—Leaflets relating to the new "Securo" low pressure steam cooker.

For Sale

Southend-on-Sea Corporation has for disposal 1,400 d.c. mercury-motor type electricity meters.

A 1,000-kW steam turbo-alternator, &c., is offered for sale by Rochdale Electricity Department.

Messrs. Goddard & Smith are to sell a large stock of electrical goods by auction on July 2nd at 70, Seymour Place, Bryanston Square, W.1.

Edmonton Urban District Council has for disposal electric vehicles and charging plant.

Tenders are invited by the Post Office Stores Department for the purchase, dismantling and removal of generating plant, &c., from the Leafield Radio Station, Oxford.

(See our advertisement pages to-day.)

A printer's error occurred in Messrs. Alaway & Partners' advertisement in our last issue (Supplement, p. 11), relating to the sale of the assets of Everlite, Ltd. The opening date for tenders is July 7th, not 27th as stated.

The Film as Trade Missionary

To stimulate overseas trade, British Insulated Cables, Ltd., of Prescot, have prepared a film for exhibition abroad to show the company's methods of cable manufacture and research work. There will be a preliminary London show of this B.I.C. film at the New Scala Theatre next Thursday afternoon, June 25th.

Prince George at Prescot

Prince George, accompanied by Lord Derby, paid a visit last week to the Prescot works of British Insulated Cables, Ltd., and was received by Sir Alexander Roger, the chairman of the company. After leaving the board room the Prince inspected some of the principal departments of the factory, and witnessed the manufacture of super tension cables and the stranding of wires for the 132,000-V overhead lines of the grid system.

Recent Contracts

The contract for the boiler-house coal-handling plant extensions for the County of London Electric Supply Co., Ltd., at the Barking power station has been placed with Messrs. ROBERT DEMPSTER & SONS, LTD., Elland, Yorks. The plant comprises two gravity bucket conveyors each capable of dealing with 125 tons per hour. This company also provided the existing boiler-house coal plant, including two 75-ton and two 100-ton per hour gravity bucket conveyors and electric telphers.

The PULSOMETER ENGINEERING CO., LTD., has received an order for the supply and erection of engine and electrically-driven pumping plant for the City of Chester sewage works. The plant comprises three 15-in. and three 12-in. centrifugal pumps. When all the pumps are in operation the combined delivery will exceed 28,000 gallons per minute of screened sewage against a head of approximately 50 ft.

Trade Announcements

As from June 27th, the Nottingham branch of the associated companies, the LONDON ELECTRIC WIRE CO. & SMITHS, LTD., FREDERICK SMITH & CO., and the LIVERPOOL ELECTRIC CABLE CO., LTD., will be at Lewcos House, 8, Broad Street, Nottingham, where stocks of "Lewcos," "Anacos," and "Liverpool" products will be held.

MR. R. A. ROBERTSON, electrical and radio engineer, has opened premises at 73, Church Street, Inverness.

Messrs. JOHNSON & SWAN, electrical and radio engineers, have opened premises at 25a, Parchment Street, Winchester.

Owing to a steady increase in business Messrs. DRAKE AND GORHAM WHOLESALE, LTD., have taken over larger premises in Glasgow at 51, Waterloo Street.

Referring to the recent termination of the working arrangement between them and Messrs Marryat & Scott, Ltd., Messrs. JOHN BENNIE, LTD., Glasgow, state that owing to the increase in their activities, embracing new lines of manufacture, it has been found necessary to substantially increase the capital. Additions are being made to the board.

MR. WILFRED SIMS, who has traded for the past eight years as an electrical engineer and contractor at 16, St. James Terrace, Buxton, has opened modern showroom premises at 91, Spring Gardens, Buxton. He asks for catalogues of domestic and industrial equipment.

Bankruptcy Proceedings

E. BROWN (trading as World's Wireless Stores and as J. Morton), 70, Morton Gardens, 10 and 12, Grosvenor Parade, and Forsdick Yard, Melbourne Road, Wallington; and 3, Churchyard, Croydon, Surrey, wireless dealer.—The following are the principal creditors in this recent failure:—

	£		£
Associated Distributors, Ltd.	900	Marconi's Wireless Telegraph Co., Ltd. ...	500
Barnard Accumulator Co.	248	R. Salhs	729
British General Manfg. Co., Ltd.	101	Surrey Trading Co., Ltd.	1,081
Carrington Manfg. Co., Ltd.	885	Strauss & Berliner ...	117
Chorlton Metal Co. ...	251	Southern Railway Co. ...	189
E. J. Lever, Ltd. ...	184	Wholesale Guarantee Incandescent Supply Co.	186
B. S. Lyle, Ltd.	235		

J. SAYER, electrical engineer, 177, Regent Street, W. (lately carrying on business at 53, Great Marlborough Street, W.).—The public examination of this debtor was held on June 9th before Mr. Registrar Mellor at the London Bankruptcy Court. The accounts showed liabilities of £10,449 (of which £10,326 is in respect of the unsatisfied debts of previous failures) and assets nil. Replying to the Official Receiver, the debtor said three prior failures were recorded against him, and he had not obtained orders of discharge from the last two. In August, 1929, he agreed to acquire a share in a British patent relating to a combined electric clock and wireless receiving set. He was told that his partners in the venture had obtained orders for the supply of 2,000 clocks at £20 each, and that they had placed an order for 12 clocks at £12 10s. each. He examined one of the clocks and formed the opinion that, although it was badly made, it functioned properly. For his services in connection with the exploitation of the patent he was to be given a one-third share therein, and he gave joint and several guarantees for payment of the costs of manufacturing a number of sets. In September, 1929, Radio Clocks, Ltd., was formed to exploit the invention, and he was appointed a director. The company never functioned, and in the following December judgment was obtained against him in respect of the guarantees he had given, and he was made bankrupt. The debtor attributed his failure entirely to liability under the said guarantees. The examination was concluded.

S. WATSON and E. GUEST, engineers (trading as the Bodmin Motor and Electrical Co.), Park Garage, Bodmin, Cornwall.—The first meeting of creditors was held recently at the Official Receiver's offices, 12, Princes Street, Truro. The statement of affairs showed gross liabilities of £2,434, of which £2,181 was expected to rank, and assets of £1,237, leaving a deficiency of £943. The debtors attributed their failure to "keen competition and losses on sales of motor cars by reason of the decline in values." A deficiency account dating from April 30th, 1928, showed a loss since that date of £208, against which the drawings were £674. The debtors stated that they commenced business in May, 1927, Watson contributing £250 and Guest £179. Since December, 1925, Guest had had a wireless business, which he sold in November, 1927. Balance sheets drawn up at April 30th, 1928 and 1929, showed net profits of £77 and £351, respectively. The creditors decided to appoint Mr. C. E. B. Smith, of Plymouth, as trustee of the estate, and a committee of inspection was also nominated.

W. J. LEE, dealer in wireless goods, &c., 7, Shepperton Street, Islington.—The public examination of this debtor was held at the London Bankruptcy Court on June 12, but on the application of the Official Receiver the sitting was adjourned until July 3rd. The debtor has lodged accounts showing liabilities of £4,462 against assets of £4. The following are among the creditors:—

	£		£
Partridge & Mee, Ltd. ...	197	Edison Swan Electric Co., Ltd.	121
Selectors, Ltd.	102	Emaree, Ltd.	100
Sun Electrical Co., Ltd.	103	Harris Williams Manufacturers, Ltd. ...	149
Wm. Dibbens & Sons, Ltd.	280	Houghton's	106
Wingrove & Rogers, Ltd.	107	Garnett, Whiteley & Co., Ltd.	388

H. D. SMITH (trading as the Standard Electrical and Radio Co., Ltd.,) 4a, Alpha Road, Surbiton.—This debtor's statement of affairs was dealt with in our last issue; it showed liabilities of £3,427 and assets valued at £299, leaving a deficiency of £3,128. The first meeting of creditors was held on June 10th at Carey Street, when Mr. C. Latham, 78, New Oxford Street, W.C. was appointed trustee.

The following are the principal creditors:—

	£		£
British Radiophone, Ltd.	137	Mullard Wireless Service	
Cossor, A. C., Ltd. ...	329	Pertrix, Ltd.	228
Hunt, A. H., Ltd. ...	171	Teeson Electric Co., Ltd.	155
Co., Ltd.	404	Wright & Weaire, Ltd.	139
Marconi's Wireless Telegraph Co., Ltd. ...	756	Young Accumulator Co., Ltd.	257

W. F. FLINT, electrical engineer, 53, Jameson Street, Hull.—Discharge granted, subject to the bankrupt consenting to judgment being signed against him for £225 by the Official Receiver. £225 paid to the Official Receiver in lieu of entering up judgment.

J. H. DEAN, electrician, Bryn Road, Aberystwyth.—Trustee, Mr. H. W. Thomas, 4, Queen Street, Carmarthen, released May 15th.

R. HORSFALL, electrical engineer, Midland Street, Barnsley.—Trustee, Mr. C. H. Baker, Standard Buildings, City Square, Leeds, released March 16th.

P. R. H. W. BAYNTON (Scunthorpe Service and Charging Depôt), wireless and electrical engineer, 38, Wells Street, Scunthorpe.—Last day for receiving proofs for dividend June 24th. Trustee, Mr. J. F. Wintringham, St. Mary's Chambers, Great Grimsby.

F. CLEASBY, junior, electrical engineer, 2, Richmond Terrace, Darwen.—Receiving order made June 10th on debtor's own petition. First meeting, June 19th, at the Official Receiver's office, District Bank Chambers, Blackburn. Public examination, July 8th, at the County Court House, Victoria Street, Blackburn.

E. A. BLEST, radio dealer, 71a, Halesowen Road, Old Hill, Staffs.—First meeting, June 22nd, at the Official Receiver's office, 1, Priory Street, Dudley. Public examination, July 8th, at the Court House, Priory Street, Dudley.

H. F. SPENCE (H. F. Spence & Sons), electrical engineer, 2, Eureka Terrace, Honiton.—Application for discharge to be heard on July 15th at the Castle, Exeter.

E. L. PRATT, electrical engineer, 5, Nowell Mount, Harehills, Leeds.—Trustee, Mr. C. H. Baker, Standard Buildings, City Square Leeds, appointed June 9th.

D. W. MORPHY, manufacturer of wireless apparatus, 14, Collinette Road, Putney, S.W.15.—First dividend of 2s. 3d. in the £, payable at Bankruptcy Buildings, Carey Street, W.C.

W. M. HORSFALL, electrical engineer, 7, Redcross Street, Liverpool.—Seventh dividend of 5½d. in the £, payable June 18th at the Official Receiver's office, Government Buildings, Victoria Street, Liverpool.

T. J. HORN (Thomas Horn & Co.), electrician, 5, Harrogate Parade, Moortown, Leeds.—First and final dividend of 1s. 8d. in the £, payable June 25th at the Official Receiver's office, 24, Bond Street, Leeds.

Company Liquidations

REDISON, LTD.—Creditors' voluntary winding up. Joint liquidators: Mr. R. V. Newland, 159, Great Charles Street, Birmingham, and Mr. F. E. Bendall, Midland Chambers, Warwick Passage, Corporation Street, Birmingham. Particulars of claims by June 30th to the liquidators.

MASON (ELECTRO-MEDICAL), LTD.—Winding up voluntarily. Liquidator: Mr. H. A. Snelling, 24, Essex Street, W.C.

Electricity Supply

Lighting, Domestic, Power

Ashton-under-Lyne.—LOAN SANCTIONED.—The Joint Tramways and Electricity Board has received sanction to the borrowing of £7,500 for sub-stations and equipment.

Bangor.—EXTENSIONS.—Provision is being made by the Corporation Electricity Committee for extensions to its distribution system. It is intended to apply for sanction to loans of £1,000 for mains and services for prospective new consumers, £2,000 for the purchase of hire-purchase apparatus and £1,000 for hire-purchase wiring and installations.

Birkenhead. — SUB-STATION EQUIPMENT. — The Corporation Electricity Committee is to apply for sanction to a loan of £2,633 for the equipment of a sub-station to be erected in Woodchurch Road.

Blackpool.—AUTUMN ILLUMINATIONS.—This year's autumn illuminations at Blackpool are to be on a lavish scale. Mr. C. Furness, electrical engineer, and Mr. F. W. Field, his assistant, have just returned from a visit to France, where they viewed the illuminations at the International Exposition at Vincennes, Paris, and secured some new ideas in lighting devices. The illuminations will last from September 19th to October 19th, and the cost will be £12,200, or £500 more than last year. There will be a special scheme of neon lighting for Talbot Square and there will be over 250,000 lights in this year's illuminations. Electricity will be supplied to residents at a specially reduced rate.

Bromley (Kent).—PUBLIC LIGHTING IMPROVEMENTS.—The Town Council has decided to improve the public lighting by the use of centre suspension electric lamps at an estimated cost of £2,200.

Cambuslang.—NEW ELECTRICITY CHARGES.—The Clyde Valley Electrical Power Co., which is now responsible for the supply of electricity in Cambuslang, announces that the following standard rates will apply as soon as the change-over of the supply from d.c. to a.c. is completed:—Domestic lighting, heating, and cooking: A fixed charge of £1 per annum for each assessed normal-sized apartment, plus ½d. per kWh consumed. Lighting, heating, and cooking for shops, offices, &c.: A fixed charge of £2 per annum for the first 100 sq. ft. of floor area, and 5s. for each additional 20 sq. ft., plus ½d. per kWh consumed. Limited charge, if consumer's bill exceeds £1 6s. 8d. per year: The overall rate per kWh limited to a maximum of 4½d. Two-rate tariff for domestic premises, shops, offices, &c.: A primary rate of 4½d. per kWh and a secondary rate of ½d. per kWh. The rental and two-rate tariffs are subject to a minimum charge of £1 6s. 8d. per annum.

Carlisle.—YEAR'S WORKING.—The Corporation electricity accounts for the past year show a loss of £7,325, as compared with a profit of £1,968 in the previous year.

LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to the borrowing of £7,150 for mains and switchgear.

SUPPLY TO LONGTON.—In connection with the supply to Longton, the borough electrical engineer is to obtain tenders for the erection of overhead lines as an alternative to underground mains.

Chichester.—ELECTRICITY CHARGES.—The Corporation Electricity Committee recommends the following scale of charges for power both inside and outside the city: First 5,000 kWh per annum, 2d. per kWh; next 5,000 kWh, 1½d.; next 10,000 kWh, 1¼d.; beyond, 1½d. The question of adopting a two-part tariff has been adjourned for further consideration.

THE EXTENSION TO BARNHAM.—With regard to the extension to Barnham, underground mains are to be used instead of overhead lines as, in consequence of the fall in the price of

Back row: Councillor W. F. Walters; Councillor E. Morgan; Mr. B. Jones; Mr. J. M. Bowman.

Front row: Mr. D. Thomas; Mr. S. J. Baker; Mr. T. Wilkins; Mr. T. S. Thomas; Councillor H. E. Pope.

An I.M.E.A. Contingent from South Wales

copper, the work can be done underground at little extra expense.

Chile.—ELECTRICITY SUPPLY AGREEMENT.—A joint agreement has been concluded between the Government and the Municipality of Santiago, on the one hand, and the Compañia Chilena de Electricidad and the Compañia de Tracción y Alumbrado de Santiago, on the other, providing for the supply of electric power for 50 years to the capital and suburbs of the States of Santiago and Aconcagua and the immediately adjacent regions. The Compañia Chilena de Electricidad, owning the largest central station in Chile, is the most important electricity undertaking in the country and, in addition, controls the tramway systems in the cities of Santiago and Valparaiso. The rated capacity of the generating plant is 66,000 kW, the power distributed being derived from two modern hydro-electric plants at Maitenes. These are quite near Santiago, and extra power is obtained from two small auxiliary steam plants, one at Santiago and the other at Valparaiso. The generating pressure is 6,600 V, this being stepped up to 11,000 V for distribution.—*Reuter's Trade Service* (Santiago).

Coatbridge.—THE FUTURE ELECTRICITY SUPPLY.—After negotiations which have taken place over more than four years, the Town Council has given the contract for the future supply of electricity within the burgh for 40 years to the present distributors, the Coatbridge and Airdrie Electric Supply Co., Ltd.

Continental.—SWEDEN.—In a recent issue of *Kommersiellameddelanden*, the fortnightly paper published by the Swedish Board of Trade, preliminary figures are given regarding hydro-electric power stations in Sweden at the beginning of 1930. Only stations of at least 100 turbine h.p. are registered, and at the beginning of 1930 these totalled 1,335, their total capacity being 1,195,000 kW. The potential output of Swedish rapids and waterfalls capable of remunerative exploitation was 6,500,000 kW, so that only 18 per cent. of the power available has so far been exploited. With regard to size, 982 of the existing power stations were of less than 500 h.p. each, the total capacity of this group of stations amounting to 112,223 kW. Small plants of under 1,000 h.p. are very numerous, but their aggregate capacity is only 16 per cent. of the total. The fall of Swedish rivers is not, as a rule, very great, and about half the total power is produced by stations having a head of not over 15 m.—*Reuter's Trade Service* (Stockholm).

Coventry.—YEAR'S WORKING.—The Corporation Electricity Department showed a profit of £13,807 for the past year as compared with £19,331 in the preceding twelve months. Increased income tax charges were largely responsible for the reduced profit.

Glasgow.—MAINS EXTENSIONS.—The Corporation Electricity Committee recommends the laying of distributing mains at an approximate cost of £2,355.

Halifax.—NORMAL STREET LIGHTING RESUMED.—In response to widespread public protest against the suspension of street lighting for eight summer weeks (two of which had already passed) as a measure of economy, the Watch Committee recently held a special meeting and decided to revert to the normal summer lighting service. The period since the commencement of the lighting suspension happened to have been stormy with many very dark nights and there were strong protests from various organisations and individuals.

Hastings.—WIRING INSTALLATIONS.—The Corporation Electricity Committee is to apply for sanction to a loan of £10,000 for wiring installations.

PROPOSED FLOODLIGHTING OF CASTLE.—The Corporation Electricity Committee is to consider arrangements for floodlighting at Hastings Castle.

Holmfirth (Yorks.).—SALE OF UNDERTAKING DECLINED.—The Urban District Council has declined an offer by the Electric and Gas Industries, Ltd., to take over the town's electricity undertaking.

Ilford.—YEAR'S WORKING.—There was a net profit of £4,287 on the Corporation electricity undertaking for the past year.

Kendal.—NEW ELECTRICITY CHARGES.—The Town Council has decided that as from April 1st last consumers shall have the option of being charged for electricity for lighting and heating shops, cinemas, theatres, and offices, at a rate of £12 per annum per kW required to light the premises adequately, plus a "unit" charge of 1½d.

Maidstone.—GRID SUPPLY.—The Town Council has entered into an agreement with the Central Electricity Board for a supply of electricity at a standing charge of 2s. 1d. per kW of maximum demand, with a running charge in respect of each kWh supplied and taken, equal to the ascertained cost of coal per kWh sent out during each month, provided that in no event shall such addition be more than 0.05d. per kWh.

Manchester.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (engineer and manager: Mr. H. C. Lamb) for the year ended March 31st last record a total revenue of £1,796,892, as compared with £1,787,673 in the preceding year. Working expenses increased from £1,117,032 to £1,127,998, leaving a gross profit of £668,894 (£670,641). Interest absorbed £239,289, income-tax £78,800, and contributions to sinking fund £284,134, and there was thus a net surplus of £16,672, which compares with £46,044 in 1929-30. During the year capital expenditure amounted to £444,675 of which £249,524 was for mains. The total now spent on the undertaking stands at £11,340,478. Electricity sold decreased from 392,983,029 to 377,724,555 kWh, but the maximum demand rose from 159,710 to 162,870 kWh. The average price obtained per kWh fell from 1.07d. to 1.12d.

Morley (Leeds).—YEAR'S WORKING.—For the financial year just ended the Morley electricity undertaking made a gross profit of £5,204, an increase of £1,389 as compared with the preceding year. After providing for loan and other charges there was a net profit of £3,498 (£2,564). Sales of electricity rose from 1,023,799 to 1,174,228 kWh, the largest increase being in power consumption. The Electricity Department receives its supplies in bulk from the Leeds Corporation.

Mylor and Flushing (Cornwall).—ELECTRICITY SUPPLY NEXT MONTH.—It is announced that a supply of electricity will be available from the Carn Brea works for Mylor and Flushing next month.

Oswestry.—SPECIAL ORDER.—The Corporation has applied to the Electricity Commissioners to amend the draft Extension Order so as to include the parish of Careghofa in the area of supply.

Peterborough.—YEAR'S WORKING.—It was stated at a recent meeting of the City Council that the result of the past year's working of the electricity undertaking was a net surplus of over £4,000, as compared with a deficit of £8,813 in 1929-30. The total revenue amounted to £140,477, as against £127,354, while the working expenditure declined from £72,212 to £68,715. The gross profit was £71,762, as compared with £55,142. In spite of a drop of over a million kWh in power consumption, the total sales of electricity showed an increase from 28,340,000 to 28,341,650 kWh. The capital expenditure during the year amounted to £42,247, bringing the total capital outlay at March 31st to £880,703.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

RIPON.—Power for installations from 2½ h.p. upwards: From 2d. to 1½d. per kWh during the summer months.

ASHTON-IN-MAKERFIELD.—Lighting: A reduction of ¼d. per kWh. Domestic heating: A reduction of ¼d. per kWh. The minimum charge of 10s. per quarter has also been abolished.

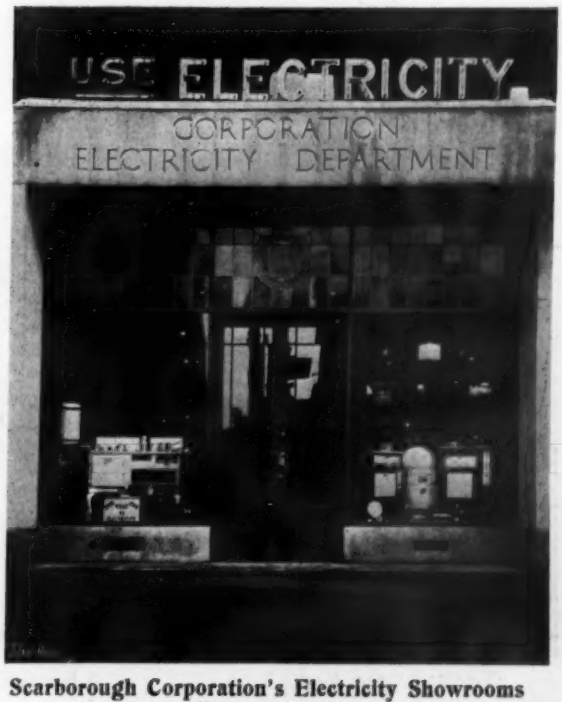
Walsall.—SUPPLY TO HOUSING ESTATE.—The Corporation is to extend mains and erect a transformer sub-station at a cost of £9,450 in connection with the supply of electricity to 1,000 houses to be erected on the Field Road estate.

Watford.—EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £7,780 and to apply for a grant for various extension schemes estimated to cost £15,000. Application is also to be made for sanction to a loan of £4,460 for the erection of sub-stations.

REVISED CHARGES.—A revision of the charges for, and conditions of hire of, electric cookers, water heaters, &c., is recommended by the Electricity Committee. The electrical engineer has also been asked to consider the question of the preparation of a simplified schedule of charges for electricity.

West Hartlepool.—COUNTY COUNCIL OPPOSE BILL.—The Bill at present being promoted in Parliament by the Corporation is to be opposed by the Durham County Council. One of the main objects of the Bill is the extension of the Corporation's electricity supply area.

Winchester.—SUPPLY IMPROVEMENTS.—In order to improve the supply of electricity the City Council has decided to re-lay cables in the city at an estimated cost of £1,105.



Scarborough Corporation's Electricity Showrooms

(See page 1033)

Traction

Brighton.—YEAR'S WORKING.—The annual report of the tramway manager states that the total revenue for the past year amounted to £137,406, a decrease of £378 as compared with the previous year. The net profit was £11,551. The number of passengers carried increased from 25,168,992 to 26,006,692.

Glasgow.—COLOUR LIGHT SIGNALS.—According to *Modern Transport*, a new colour light signalling system has been installed on the underground section of the London and North Eastern Railway, between Queen Street low-level station and Stobcross Junction. These colour light signals are illuminated day and night and work automatically with electrical rail control circuits, the passage of the trains operating the signals. This system of colour light signals is the first to be installed in the Glasgow district.

YEAR'S WORKING.—The Corporation Transport Department's accounts for the year ended May 31st last show a decrease from £2,312,741 to £2,213,029 in the revenue obtained from the tramway undertaking. Passengers carried numbered 456,848,300, as against 470,020,925, the revenue per car mile being 14.57d.

London.—RAILLESS-CAR EXTENSIONS.—The London United Tramways' railless-car route between Twickenham and Teddington has now been extended to Kingston and Kingston Hill.

Manchester.—YEAR'S WORKING.—We have received from Mr. R. Stuart Pilcher, general manager of the Corporation Transport Department, a copy of his annual report together with a statement of accounts of the undertaking for the year ended March 31st last. The total revenue from the tramways amounted to £1,646,526, as compared with £1,830,631 in the preceding year, the greater proportion of this decrease being due to the conversion of routes to 'bus traffic; £56,427 of the decrease was, however, due to the decline in traffic on routes not converted. The decline in receipts began in the early part of the year at a rate of about £700 per week and increased in volume as the year progressed, reaching a peak of about £2,500 per week in January. The working expenditure amounted to £1,331,376, as compared with £1,497,034 in the preceding year, while the gross profit declined from £333,597 to £315,150. To this was added interest on investments (£12,601) and unemployment grants (£5,074), making a total of £332,825 available. From this the following sums had to be deducted: Interest on loans, £118,711; bank interest, £2,781; sinking fund and loan instalments, £106,809; street improvements, £10,757; rent of leased lines, £32,055; fitting upholstered car seats, £5,803. There thus remained a net surplus of £55,909 (against £58,923 in 1929-30), which together with a surplus of £29,130 (£16,038) from the 'bus undertaking was transferred to the reserve and renewals account. Expenditure of a capital nature totalled £115,226, but after deducting recoverable expenditure the net amount for the year was £48,987. The total capital expenditure at March 31st was £4,751,268. The number of passengers carried on the trams decreased from 326,286,679 to 292,701,082 and the car mileage from 24,477,216 to 22,499,728. The average revenue per car mile fell from 17.949d. to 17.563d., and the total consumption of electricity from 50,392,609 to 48,165,633 kWh. The reconstruction of the permanent way was carried out over approximately 9½ miles of single track, and fifteen truck cars were converted into vestibule four-wheel cars, all of which were fitted with new type trucks and motors. In addition 71 cars were fitted with upholstered transverse seats in the lower saloon, at a cost of £10,622. Improved lighting was provided in 69 cars. Over 13 miles of permanent way were abandoned during the year and it is proposed to convert an additional 4½ miles to 'bus operation in the near future.

Telegraph and Telephone

Argentina.—RADIO-TELEGRAPHY.—The wireless transmitting and receiving stations under construction in Rio de Janeiro by the Compañia Radio International do Brazil are being prepared to work with those of the Compañia Internacional de Radio (Argentina) in Buenos Aires and the Compañia Internacional de Radio (Espana) in Madrid, as well as to provide direct service with the United States.

Marine Beacon.—PLYMOUTH.—The urgency of the establishment of a wireless direction beacon for the port was recently emphasised at a meeting of the Council of the Plymouth Chamber of Commerce. The matter was referred to the Shipping and Transport Committee for full investigation as to the cost of provision and maintenance, towards which material assistance has been offered.

The Telephone Service.—MANCHESTER AUTOMATICS.—On Saturday last some 3,000 subscribers were transferred from the manual system to automatic service in the Blackfriars exchange. This exchange will ultimately have three 10,000-line units.

Radio

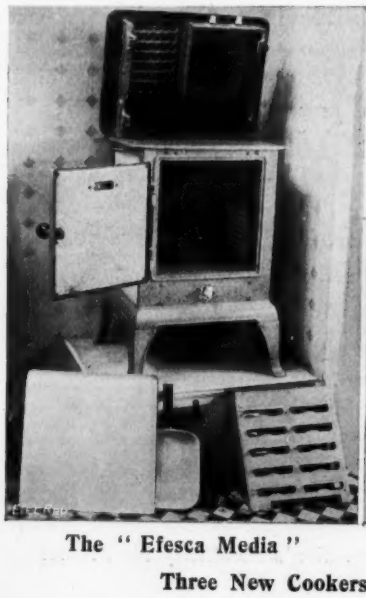
Australia.—LOWER WAVE-LENGTHS.—In a notice to radio manufacturers, dealers, and listeners, the Postmaster-General emphasises the desirability of receivers being constructed so as to cover wave-lengths between 200 and 545 metres. The continual increase in the number of stations, mostly "B" class, throughout the Commonwealth has made it necessary to make provision for wave-lengths as low as 200 metres.

EXPERIMENTERS' FEES.—A notification has been made by the Post Office that experimenters' licence fees entitling them to transmit are to be increased from £1 per annum to 30s.; as they can use their apparatus for receiving the ordinary broadcast programmes they should not pay less than the ordinary listener's licence fee of 24s.

Irish Free State.—A.C. BATTERY ELIMINATORS.—We are informed that battery and d.c. mains-operated receivers are being converted to a.c. mains operation by the I.F.S. Electricity Supply Board "free of charge" to the user, who has to bear the expense of "fitting" only. A considerable number of applications for conversion from Cork listeners are being dealt with promptly by a representative of the Board who was sent to Cork for the purpose.

Licence Fees.—P.O. CONCESSION.—The Postmaster-General announces a concession to listeners, for he proposes that, as from April 1st last, the Post Office shall retain only one shilling, instead of 1s. 3d., out of the ten-shilling licence fee now paid by every wireless listener. Thus the Post office will take only 10 per cent., instead of 12½ per cent., of the licence fee. This means an addition of about £35,000 a year to the income of the B.B.C. The threepence which the Post Office is thus conceding does not all go to the B.B.C., but is shared between it and the Treasury, according to a sliding scale of percentages.

North Africa.—NEW STATIONS.—The power of Radio-Morocco is to be increased from 1.2 kW to 8 kW and the height of the aerial towers will be increased to about 150 feet. Plans have matured for the erection of a modern transmitter at Meknes, between Rabat and Casablanca, which will have a power of 15 to 20 kW. It is probable that a new station will be installed at Nabeul, about thirty miles from Tunis, where the studio will be, connected by a special telephone line. The equipment and operation of the new station will probably be entrusted to the company that is in charge of the Radio-Toulouse station.



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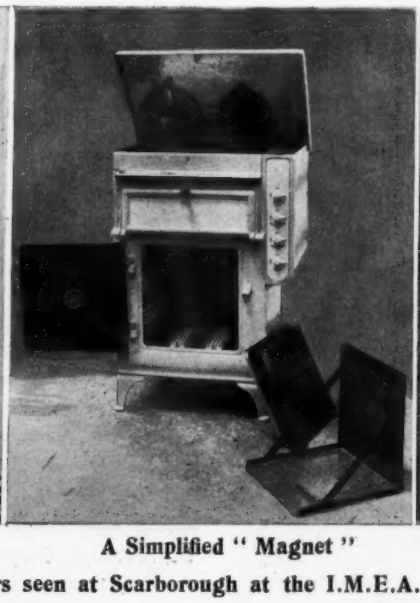

A Simplified "Magnet"

The "Jackson 64"

Three New Cookers seen at Scarborough at the I.M.E.A. Exhibition **(see p. 1025)**

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Barnoldswick.—June 27th. Urban District Council. Cable extensions. (June 12th.)

Basford (NOTTS.).—June 22nd. Urban District Council. Installation of electric lighting and power at Rock House. Particulars from Mr. H. Stone, Rock House (deposit £3 3s.).

Belgium. — LIEGE. — June 27th. Municipal authorities. Armoured cables for Electricity Department. Particulars (cahier des charges) for 5 francs from the Bureau des Finances, Annexe de l'Hôtel de Ville.

Burntisland (FIFE).—June 27th. County Council. Electric lighting installation in 20 houses. Particulars from Mr. Wm. Williamson, architect, Kirkcaldy (deposit £1 1s.).

Coupar Angus (PERTHSHIRE).—Town Council. Electric lighting installation at the Town Hall. Specifications from Mr. J. E. McEwan, 62, Robertson Street, Glasgow (deposit £1 1s.).

Denmark.—COPENHAGEN.—July 1st. Lighting Department. Transformers for H.C. Oersted power station. (A. 10944.)*

Denny and Dunipace.—June 22nd. Town Council. Electrical work in connection with housing scheme. Schedules from Messrs. James Strang & Wilson, 39, Vicar Street, Falkirk.

Dublin.—June 24th. Vocational Education Committee. Electric lighting at new extension to the Bolton Street Technical Schools. Specifications from Mr. L. E. O'Carroll, chief executive officer, Technical Schools, Bolton Street.

Dundee.—June 29th. Works Department. Switchboard, booster, and 20-kW steam-driven d.c. generator for Ashludie Sanatorium, Monifieth. Specifications, &c., from Mr. D. H. Bishop, city electrical engineer, Dudhope Crescent Road, Dundee.

East Ham.—June 22nd. Education Committee. Installation of electric lighting at Cornwell, High Street and Plashet Schools. (June 5th.)

Egypt.—CAIRO.—August 1st. Ministry of Public Works. Pumping and filtering plant for Edfu power station. (G.X. 10450.)*

Fife.—July 1st. County Council. Electric lighting installation in 12 blocks of houses. Schedules from Mr. G. B. Deas, architect, Central Chambers, Kirkcaldy.

Glasgow.—June 22nd. Corporation. Electric lighting installation in connection with the West Drumoyne housing scheme. Specifications from the general manager, Electricity Department, 4, West Regent Street.

Grays Thurrock.—July 8th. Electricity Department. Static transformers, h.p. and l.p. switchgear and l.p. cables. (See this issue.)

Hyde.—June 23rd. Corporation. Automatic traffic control signals. Particulars from the borough surveyor.

Lichfield.—July 1st. Staffs. Education Committee. Electric lighting installation at Lichfield Grammar School and headmaster's house, &c. Specifications (deposit £4 4s.) from Messrs. Moffet, Rosher & Mann, consulting engineers, Union Chambers, Temple Row, Birmingham.

Liverpool.—June 25th. Electricity Supply Department. H.p. and l.p. switchgear for static sub-stations. (June 12th.)

London.—CENTRAL ELECTRICITY BOARD.—June 22nd. Site works, foundation works, buildings and cable bridge at Stockport and Bolton for the North-West England and North Wales Electricity Scheme. (May 22nd.)
June 29th. 33,000-V transformers for the North-West England and North Wales Electricity Scheme. (June 5th).
July 20th. Central indication and telephone equipments for the Mid-East England Electricity Scheme. (See this issue.)
LONDON COUNTY COUNCIL.—June 22nd. Static transformers with e.h.p. and l.p. switchgear for Greenwich power station. (May 29th.)
July 6th. Wiring and fittings for electric lighting at Pavilion A, Hackney Hospital. (See this issue.)
OFFICE OF WORKS.—June 22nd. Fuse boards and switches. (June 12th.)
July 7th. Wiring for lighting and power at the new Geological Museum, South Kensington. (See this issue.)

Maidenhead.—June 24th. Town Council. Electrical installations in 30 houses in Boyn Valley Road. Particulars from Mr. C. O. Milton, borough electrical engineer.

Manchester.—June 29th. Electricity Department. Transformers, supervisory control equipment and sub-station switchgear. (June 12th.)

Milford Haven.—July 2nd. Electricity Department. Generating plant. (June 12th.)

New Zealand.—WELLINGTON.—August 27th. Government Railways. Underground telephone cable equipment between Wellington and Paekakariki. (A.X. 10932.)*
August 19th. Post and Telegraph Department. Private automatic branch exchange equipment. (A.X. 10967.)*
August 25th. Public Works Department. Storage battery for Mangahao power scheme. (A.X. 10964.)*

North Riding.—County Council. Automatic traffic control signals at Redcar and Eston. (See this issue.)

Ripon.—June 29th. West Riding Education Committee. Electric lighting installation at the Grammar School. Specifition from the education officer, County Hall, Wakefield.

Siam.—BANGKOK.—July 31st. Post and Telegraph Department. Armoured underground telephone cables. (A. 10928 and A.X. 10955.)*

South Africa.—JOHANNESBURG.—July 27th. Railways and Harbours. Lighting units for the new Concourse Railway Station. (G. 10452.)*
July 16th. City Council. Recording voltmeters. (A.X. 10952.)*
PORT ELIZABETH.—July 23rd. City Council. Automatically-controlled centrifugal pumps, &c., for Baakens Valley main sewerage scheme. (G.X. 10461.)*

Staffordshire.—July 1st. Education Committee. Electric lighting and power installations at several school buildings. (June 12th.)

West Midlands.—July 11th. Joint Electricity Authority. 11,000-V underground cables and l.p. overhead and underground distribution system. (See this issue.)

Woodhouse (YORKS.).—June 29th. West Riding Education Committee. Electric lighting installation at the Woodhouse Secondary School (extensions). Specification from the education officer, County Hall, Wakefield.

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Cheltenham.—Electricity Committee. Accepted:—
Feeder cable (£970).—Derby Cables, Ltd.
Switchgear (£92).—British Thomson-Houston Co., Ltd.

Clacton-on-Sea.—Urban District Council. Accepted:—
Cooling plant for the electricity works (£530).—Visco Engineering Co., Ltd.

Dewsbury.—Town Council. Accepted:—
E.h.p. cables.—Hackbridge Cable Co., Ltd.
L.p. cable.—Derby Cables, Ltd.

Dundee.—Town Council. Accepted:—
Public lighting of Kirriemuir (£395).—D. H. Morris & Co.
Messrs. Edmiston Brown & Co., Ltd., power engineers, Glasgow, have carried out the electrical installation at Messrs. Briggs' new bitumen works, while the electrical installation of the offices was carried out by Maxwell (Dundee), Ltd.

Glasgow.—Electricity Committee. Recommended:—
Locomotive battery (£788).—D.P. Battery Co., Ltd.
Air coolers for Nos. 4 and 5 alternators at Dalmarnock power station (£1,400).—Serck Radiators, Ltd.
Health Committee. Recommended:—
Installation of new cooking plant for Hawkhead Mental Hospital (£1,480).—Carron Company.
Municipal Transport Committee. Recommended:—
Automatic telephones for head office.—Standard Telephones and Cables, Ltd.

Hastings.—Improvements Committee. Recommended:—
Ventilating plant, motors, fans, &c., for underground parking station (£1,214).—Musgrave & Co., Ltd.

Spalding.—Urban District Council. Accepted:—
Switchgear for a sub-station at Surfleet (£764).—A. Reyrolle and Co., Ltd.

Stockport.—Town Council. Accepted:—
Cables (£14,350).—W. T. Glover & Co., Ltd.

Sunderland.—Town Council. Accepted:—
Switchgear for Hylton Road power station (£14,554).—General Electric Co., Ltd.

Tilbury.—Urban District Council. Accepted:—
120 cookers.—General Electric Co., Ltd.

Wallasey.—Electricity Committee. Accepted:—
Supply and erection of Hardinge-Rovac plant to deal with the flue dust slurry at the generating station (£5,373).—Mining & Industrial Equipment, Ltd.

Watford.—Electricity Committee. Recommended:—
Switchgear for Riverside sub-station (£298).—J. S. Plumtree.

Forthcoming Events

Incorporated Municipal Electrical Association.—June 15th-20th. Scarborough. Annual Convention.

International Conference on Extra-high-pressure Systems.—June 18th-27th. Paris, France.

Institution of Heating and Ventilating Engineers.—June 22nd-24th. Harrogate. Summer meeting.

Royal Society of Arts.—Wednesday, June 24th. Adelphi, W.C. 4 p.m. Annual general meeting.

Electrical Contractors' Association.—June 24th-26th. Eastbourne. Annual Conference.

Municipal Tramways and Transport Association.—June 24th-26th. Southampton. Annual Convention.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following:—

"SOL" electric irons.
Presspahn bobbins for small induction motors.
We have also been asked for the address of the Mayfair Refrigerator Co.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Ignition & Electrical Services, Ltd.—Private company. Registered June 11th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, mechanical engineers, manufacturers and repairers of and dealers in machinery and electrical and other apparatus, &c. The subscribers are: H. Smith, 58, Radford Road, Coventry (clerk), and W. A. Bromwich, Canley Road, Coventry (electrical engineer). The first directors are not named. Secretary: J. Butler, 38, Bailey Lane, Coventry.

London Relay Wireless, Ltd.—Private company. Registered June 11th. Capital, £1,000 in £1 shares. Objects: To obtain licences in connection with establishing and working wireless receiving stations in and about the counties of Middlesex, Surrey, Kent and Essex, and especially within the County of London. The subscribers are: W. Mannin, 42, Arnott Road, Peckham, S.E. (solicitor's clerk), and J. B. Whelan, 32, Ulundi Road, Blackheath, S.E.3 (clerk). The first directors are to be appointed by the subscribers. Secretary: N. F. C. Forsyth. Registered office: 113, Temple Chambers, Temple Avenue, E.C.4.

Radio Central Exchanges, Ltd.—Private company. Registered June 10th. Capital, £25,000 in £1 shares. Objects: To encourage, establish, maintain and develop services for the relaying of radio programmes to subscribers and others in any part of the world, &c. The directors are: A. B. Winch, Broomhall, Broadbridge Heath, Horsham, Sussex, and W. T. Whaley, Granville House, Byfleet, Surrey (managing director of Guildhall Trust Co., Ltd.). Registered office: 37, Walbrook, E.C.4.

Major Equipment Co., Ltd.—Private company. Registered June 10th. Capital, £10,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, suppliers of electricity, manufacturers of and dealers in railway, tramway, electrical and other apparatus, &c. The first directors are: F. A. Minter, "Greystock," Peek Crescent, Wimbledon Common, and C. J. Goldsmith, The Nook, Well Lane, East Sheen, S.W.14. Solicitors: Walter, Burgis & Co., 31, Budge Row, E.C.

Reliance Radio, Ltd.—Private company. Registered June 6th. Capital, £100 in £1 shares. Objects: To carry on the business of wireless manufacturers, dealers in electrical apparatus, gramophones and records, &c. The first directors are: Mabel F. Wills, 183, High Road, Dagenham, and W. H. W. Corke, 163, Hectorage Road, Tonbridge, engineer.

Edward Holme & Co. (1931), Ltd.—Private company. Registered May 11th. Capital, £10,000 in £1 shares. Objects: To acquire the lands, engineering works and premises at Moss Lane, Altrincham, Cheshire, and other property, assets, &c., of Edward Holme & Co., Ltd.; to acquire the benefit of inventions at present used by the said company in relation to the distant control and other apparatus for use in connection with hydraulic or electric cranes; also to carry on the business of ironmasters, steel makers and convertors, manufacturers of boilers, engines, turbines, locomotives, motor cars and cycles, electrical and hydraulic engineers, &c. The first directors are: W. Clarke, Oaklea, Cleveland Road, Hale, Cheshire (engineer), R. Pitt, Wyvenhoe, Grove Lane, Timperley (works accountant), R. H. Fawcett, "Alrae," Rosslyn Road, Firswood, Chorlton-cum-Hardy, Manchester (engineer), and J. Robinson, Ravenscraig, Marine Crescent, Waterloo, Liverpool (engineer). Secretary: R. Pitt. Solicitors: Vaudry, Osborne & Mellor, 30, St. Ann Street, Manchester.

Colassion, Ltd.—Private company. Registered June 6th. Capital, £9,000 in 8,000 8 per cent. cumulative participating preference shares of £1 each and 20,000 deferred shares of 1s. each. Objects: To acquire the benefit of rights in respect of inventions relating to electrical sound reproducing apparatus. The subscribers are: Col. T. W. Vigers, 4, Alma Terrace, W.8, and W. L. Colassi, 26, Burnham Court, W.2 (electrical engineer). The first directors are not named. Solicitors: Wm. Easton and Sons, 43, London Wall, E.C.2.

Returns of Electrical Companies

John Lightfoot, Ltd.—Capital, £10,000 in £1 shares. Return dated March 13th, 1931. 3,600 shares taken up. £3,600 paid. Mortgages and charges, nil.

Cavendish Trading Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1930 (filed April 8th, 1931). 999 shares taken up. £335 paid. £664 considered as paid. Mortgages and charges, nil.

Hassocks & Hurst Electricity Co., Ltd.—Capital, £5,000 in £1 shares. Return dated May 21st, 1931. All shares taken up. £250 (1s. per share) paid. Mortgages and charges, nil.

Viozone, Ltd.—A. J. Foster, C.A., of 37, Walbrook, E.C., was appointed receiver on June 3rd, under powers contained in debenture dated October 22nd, 1929.

G. Yeldon, Ltd.—E. H. Hawkins, of 4, Charterhouse Square, E.C.1, ceased to act as receiver and manager on June 4th.

E. Jeffery, Ltd.—H. V. Went, of "Homestead," May Avenue, Canvey Island, was appointed receiver and manager on June 2nd, under powers contained in debenture dated July 1st, 1930.

Peter Raven & Co., Ltd.—J. D. Kerr, of 5, Waterloo Street, Birmingham, ceased to act as receiver and manager on June 3rd.

B.E.I., Ltd.—Capital, £1,000 in £1 shares. Return dated March 19th, 1931. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Epoch Radio Manufacturing Co., Ltd.—Capital, £500 in £1 shares. Return dated January 14th, 1931. 40 shares taken up. £40 paid. Mortgages and charges: £300.

Pearsons Electricals, Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1930 (filed March 14th, 1931). All shares taken up. £100 paid. Mortgages and charges, nil.

Woodward, Smith & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 5th, 1931. 373 shares taken up. £373 paid. Mortgages and charges, nil.

South Bedfordshire Lighting & Ignition Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1930 (filed March 21st, 1931). All shares taken up. £500 paid. Mortgages and charges, nil.

Impex Electrical, Ltd.—Capital, £2,000 in £1 shares. Return dated February 3rd, 1931. 500 shares taken up. £500 paid. Mortgages and charges, nil.

Vernon Smith & Sons, Ltd.—F. R. Humphris, of 57, Dewsbury Crescent, Chiswick, W.4, was appointed receiver on May 22nd, under powers contained in debenture dated November 20th, 1930.

Colne Valley Electric Supply Co., Ltd.—Satisfaction to the extent of £2,650, on May 31st, of 5½ per cent. debenture stock secured by trust deeds dated July 4th, 1925, and November 20th, 1926, and registered July 17th, 1925, and November 25th, 1926.

W. E. Langton, Ltd.—Capital, £6,000 in 2,000 "A" and 4,000 "B" shares of £1 each. Return dated November 6th, 1930 (filed May 6th, 1931). 1,250 "A" and 4,000 "B" shares taken up. £5,250 paid. Mortgages and charges, nil.

City Notes

Calcutta Tramways Co., Ltd.

Presiding at the annual meeting on June 10th, Mr. J. G. B. Stone (chairman), in presenting the report and accounts (ELEC. REV., June 5th, p. 970), said the falling-off in the total traffic receipts of £66,631 was due to the world-wide trade depression, severely felt in Calcutta, to the prevailing political conditions, including rioting, which, commencing with the carters' strike on April 1st, was followed by almost continual trouble consequent upon "hartals" connected with the "civil disobedience movement" and the arrest of the leaders of that movement, and, lastly, to the intensified and indiscriminate omnibus competition. It became impossible to continue to run their omnibuses at a loss, which during the year 1930 amounted to £35,000, seeing that the licensing authorities of Calcutta had declared for unlimited competition, there being over 350 separate owners running omnibuses on the streets of Calcutta during the year under review. They, therefore, had no alternative but to order the closing down on February 1st last of their feeder omnibus services, retaining only, for the time being, the service connecting Howrah with Calcutta, and instructions for the withdrawal of this service had since been given. As to the future, they realised that tramways required to be modernised to meet the new conditions now prevailing, but they had been handicapped by the difficulty arising from the terms of their concession, which gave the municipality the right of purchase in 1931, renewable thereafter at periods of seven years. Summarised, the concession was in perpetuity, but with the right of purchase by the municipality as a going concern at seven-year periods. Having passed the first period, they decided to commence the modernising of the tramways. The first of the new rolling stock, which was of the most up-to-date type suitable for local conditions, was now partly in transit and partly in process of erection, and it had been decided to equip all the cars with air brakes, which would materially improve the service generally. With the re-establishment of normal conditions, there seemed no reason why the tramway business should not resume its former prosperity, as the curve showing returns in cash receipts, in spite of the reduction in fares, was rising in comparison with the same period last year. The report and accounts were adopted.

Telephone Rentals, Ltd.

The annual meeting was held on June 10th Mr. F. T. Jackson (chairman and managing director) presiding. In presenting the report and accounts (ELEC. REV., June 5th, p. 790), the chairman said that during 1930 the revenue from rentals increased by a sum running into five figures. This achievement was very satisfactory as, with the exception of those trades which had benefited from the McKenna and Safeguarding Duties, the year had been one of unparalleled depression. Yet, in spite of this, they had held their own, the profit earned being only slightly less than that for 1929. The continued trade depression had caused a larger number of installations to be recovered than was usual, but the new business done had more than counterbalanced this. Their business was one of the few which provided apparatus necessary to almost every trade and profession in the country. In consequence, they were in touch with all industries. Apart from those trades which were protected, they could not say that any one particular trade was doing better than another. The businesses which were doing best were those which were not so big that the man at the head could not keep in touch with all the principal activities in the development and organisation. He viewed with anxiety the growth of amalgamation and so-called rationalisation schemes. In many cases they represented the summit of ambition reached by one man. The fact remained, however, that he could not maintain that close personal touch so necessary to ensure a successful business. It was not possible to abolish individualism or personality and still retain a successful business. Their Australian subsidiary had had a difficult period to face, yet in

spite of those difficulties had only made a loss of £1,681, which was met out of profits brought forward from previous years. They had cut down their outstandings and liquidated their stocks, and with a drastic cutting down of expenses and curtailment of country credit facilities, the Australian company would be able to weather the storm, even if trade during 1931 was worse than it was in 1930. During the year under review they had been exploring the possibility of securing capital " on tap " to finance the business of their new system companies, and negotiations had terminated satisfactorily with one of the leading insurance companies which, on a revival in trade, would bring in additional profit for the shareholders. The report and accounts were adopted.

India Rubber, Gutta Percha and Telegraph Works, Co., Ltd.

In a circular to the shareholders, the directors state that during the first half of the current financial year the effects of reorganisation have become increasingly apparent. They regret, however, that the results of the half-year's trading do not warrant the payment of the arrears of dividend due to the preference shareholders nor the further half-year's dividend due on July 1st. The turnover is within 10 per cent. of that of the corresponding period of last year notwithstanding the heavy fall in prices and the declining market. The effects of trade depression are being more acutely felt both by the Persan works and by the company's foreign branches. In spite of the reduced turnover the position both at Silvertown and Burton has improved as the result of drastic economies, but the Burton factory still continues to show a loss. The question of obsolete and redundant plant is receiving the close attention of the directors. It has been decided that the company's financial year shall terminate at September 30th in this and each succeeding year, thus reverting to the former practice. The lease of the premises in Cannon Street, London, E.C., expires in September next, and the company has acquired a lease, at a substantial saving, of more convenient premises at Aldwych House, to which the head office and London branch will shortly be transferred.

Ceara Tramway, Light & Power Co.

The holders of the 5 per cent. first mortgage debenture stock have been informed that it is proposed to revise the provisions of the debenture stock trust deeds relating to the redemption of the stock. The directors state that the annual sinking fund payments stipulated are quite inadequate to bring about the extinction of the stock by the specified date, 1956. It is proposed, therefore, that the company shall provide an annual sum which, after payment of half-yearly interest, will leave a fund adequate to extinguish the debenture stock debt by 1986, the date up to which the company's monopoly rights under its concession extend.

Hick, Hargreaves & Co., Ltd.

The report for the year ended March 31st last shows a profit of £10,736. After providing for depreciation, debenture interest, &c., the net profit is £6,208, to which is added £2,596 brought forward, making £8,804 available. It is proposed to pay a dividend of 2 per cent., less tax, and to place £1,000 to general reserve (making that fund £11,000), leaving £3,003 to be carried forward. The report states that the difficulties of the past year are reflected in the year's results, the turnover being reduced, while, owing to the extreme competition for the small amount of work available, the margin of profit on the turnover is seriously decreased. The value of uncompleted work on the books is rather greater than at the commencement of the year. During the past year a department has been opened for the manufacture and sale of turbo and rotary compressors, blowers and exhausters for air and gas. Mr. J. G. Hudson, a director, has retired from the board owing to ill-health. Meeting: June 24th.

Lisbon Electric Tramways, Ltd.

In the course of his speech at the annual meeting on June 10th, Lt.-Col. S. H. Pollen (chairman) said that the tramway had been operated continuously and smoothly throughout the year, and nothing had occurred to interfere with the steady growth of their traffic. During the year under review 125,002,462 passengers were carried, with receipts of 75,517 contos, against 118,824,952 passengers and 72,251 contos in receipts. The rate of exchange had kept firm during the year, with practically no fluctuation. This was undoubtedly a very favourable factor for the company. The accounts showed an extremely sound financial position, and they looked forward to the future with confidence. The report and accounts were adopted.

Electric Furnace Co., Ltd.

The net profit for the year ended March 31st last was £4,400, plus £3,093 brought forward. The preferred ordinary dividend absorbs £5,600 and £1,892 is carried forward. No dividend is recommended on the ordinary shares, which for the preceding year received 7 per cent. According to *The Times*, the report states that arrangements have been made by which the subsidiary company's patents and drawings of resistance furnaces will be exploited in the United States by an American company, which has formed a subsidiary company for the purpose. A substantial cash payment and an interest in this company were received in exchange for patents and information. Meeting: June 24th.

General Electric Co., Ltd.

The accounts for the year ended March 31st last, which have been submitted to the board of directors, show a profit of £1,122,007, as compared with £1,179,007 in the preceding year. It is proposed to pay a dividend of 10 per cent., less tax, on the ordinary shares, against 10 per cent. and a bonus of 4 per cent. in the previous year. Meeting: June 30th.

At an extraordinary meeting of the holders of the prior lien mortgage debenture stock of *Low Temperature Carbonisation, Ltd.*, on June 18th, a resolution was carried sanctioning the extension for five years of the term of the 8 per cent. prior lien debentures which fall due for repayment on July 1st next.

The report of *Mirrlees, Bickerton & Day, Ltd.*, for the year ended March 31st last shows a net profit, after providing for depreciation, &c., or £4,246 (against £32,134 in the previous year), to which is added £12,283 brought forward, making £16,529 available. The preference dividend is met, but as announced in our last issue, no ordinary dividend is proposed (against 7 per cent.). The amount carried forward is £13,274.

The report of the *Madras Electric Supply Corporation, Ltd.*, for 1930 states that the balance at revenue account was £122,669 (against £117,482 in 1929). After providing for debenture interest, sinking fund, depreciation and renewals, &c., there is a net profit of £69,011, plus £7,444 brought forward. A final ordinary dividend of 5½ per cent. is proposed, making 8 per cent., tax free, for the year (same), and £10,625 is carried forward. The electrical energy sold increased from 19,437,251 to 20,581,815 kWh. Meeting: June 16th.

The *International Telephone and Telegraph Corporation* has declared a regular quarterly dividend of 50 cents per share, payable July 15th.

The directors of the *Globe Telegraph and Trust Co., Ltd.*, have announced a final dividend of 3s. 6d. per share net on the ordinary shares, making a total payment for the year of 8½ per cent. (against 10 per cent.).

The *Eastern Telegraph Co., Ltd.*, has announced a dividend at the rate of 3½ per cent. per annum, less tax, on the preference stock, for the quarter ending June 30th.

The directors of *Greenwood & Batley, Ltd.*, have announced a final dividend of 2½ per cent., making 5 per cent. for the year (same).

Stocks and Shares

TUESDAY EVENING.

APART from this week's numerous sporting events which distract to some extent the attention of the public from such mundane matters as stocks and shares, there has been a close fixing of attention upon the political situation, and the prospect of the Government being placed in an awkward position arising out of the proposed land tax. The crisis blew over, of course, but the mere suggestion that last week's dissension between the Government and the Liberal Party might lead to a dissolution had the effect of bringing about a violent rise in a good many prices. The Home Railway market in particular, and the Industrial market to a less noticeable extent, welcomed the vague chance of a changed Government, and put up prices considerably. Although cool opinion did not look for a Government defeat, the mere expectation of such a thing served to infuse a harder tone into Stock Exchange prices. A financial crisis of no little magnitude arose in Germany, but was met efficiently, and had no particular effect, except in local securities. Cable stocks are firmer, and the manufacturing group also shows an improving disposition.

Gilt-Edged Stocks

Amongst the gilt-edged stocks, the strength of Central Electricity 4½ per cent. debenture at 97½, and of London and Home Counties 4½ per cent. debenture at 98, continues to be an outstanding feature. London Power 5 per cent. debenture stock is offered at 105½. The latest New Zealand loan of 5 million pounds, issued for productive purposes—*e.g.*, hydro-electric power works, telephone and telegraphic extensions—was left with the underwriters to the extent of 68 per cent. County of London 5 per cent. new debenture stock is available at 104. It is expected that a new issue of South Metropolitan Electric 4½ per cent. debenture stock will shortly be marketed in the neighbourhood of 97. The new Lancashire Electric 5 per cent. debenture stock is being dealt in on the basis of 101¼. The company placed the stock at 97½.

Electricity Supply Shares

Electric Supply Corporation ordinary have hardened to 42s. 6d., the improvement representing the amount of dividend deducted last Thursday. Charing Cross ordinary strengthened to 30s., and Westminster ordinary to 29s. It would appear as though the tendency of London electricity supply shares will be for the prices to advance to the neighbourhood of 30s. or thereabouts. It can hardly fail to have been noticed that the shares of the group have been quietly mounting from the common price of 26s. at which most of them started after the rearrangement of capitals which followed upon the passing of the London Electricity Act. Holders of the shares have received good dividends, and they have the still more substantial satisfaction of knowing that during the past two years, when industrial shares of nearly every description have fallen heavily in price, theirs have been almost the only group to resist the depreciation and to increase in value. Hendon Electric ordinary have gone back to 3½.

Traction Stocks

The violent rise in Home Railway stocks, to which reference has already been made, included a gain of 2 points in Metropolitan consolidated, raising the price to 48¼. Districts were passed by, and the price is unchanged at 64½, but Underground Electric ordinary shares at a guinea have gained a shilling, and the Central London stocks are also a little better. The purchase of a very few thousand pounds of Metropolitan ordinary caused the price to jump suddenly, and it seems very certain that the market is poorly supplied with stock. Underground Electric ordinary had been depressed, according to rumour, by selling on behalf of a deceased account, which speculation not unnaturally associated with the recent death of Mr. Solly Joel. The speculation was probably quite wrong, but whenever the price happens to be dull for one reason or another, the easiest explanation will be a hint of deceased account stock coming to market.

London and Suburban Traction preference shares have not moved from 11s. 6d., and London United Tramways 4 per cent. debenture stock remains at 62½.

Cables and Wireless

The scarcity of stock in the markets is further exemplified by the recoveries which have occurred in Cables & Wireless issues. The preference went up 3 points to 54½, the ordinary 2 to 14, and the "B" to 8, a gain of a point. It cannot be said that there was any particular rush to buy the stocks on behalf of the public, and for the real reason of the improvement it is necessary to fall back upon the same trite, but correct, reference to purchases on behalf of bears who became frightened at the prospect of a change of Government and the possibility at which this hinted of a general revival in stocks and shares that had fallen to very low levels. Other issues in this market are changed but slightly. Marconi Marines strengthened to 32s. 6d. Anglo-American preferred is ¼ better at 104¼. Globe Telegraph & Trust, both ordinary and preference, continue weak at 7½ and 8½, respectively. American Telephone & Telegraph at 174 is a shade lower than it was a week ago, after its rise of 9½ points, while International Telephone & Telegraph is 2½ better at 29. The company has declared the regular quarterly dividend of 50 cents per share. A rumour current in the Wall Street Stock Exchange, quoted in a Stockholm newspaper, says that the International Telephone & Telegraph Corporation proposes to acquire the Swedish Telephone Company. The latter is one of the International Telephone's principal competitors, the majority of these shares being controlled through Kreuger & Toll.

Manufacturing Issues

The final dividend for the year on G.E.C. ordinary shares has been announced, making a total of 10 per cent. for the year, as compared with 10 per cent. and 4 per cent. bonus for the previous year. Siemens, at 22s., are ex dividend. The India-Rubber, Gutta Percha and Telegraph Works Company states that the effects of reorganisation are becoming increasingly apparent, though the results do not yet warrant the payment of the arrears of dividend on the preference shares, nor the further half-year's payment due on July 1st. The price of the shares continues dull at 4s. 6d. Philips' Incandescent Lamps have recovered a trifle to 18s. 9d. It is said that no little dissatisfaction continues to prevail in Amsterdam by reason of the disappointing character of the company's recent report.

Iron and Steel Recovery

The iron and steel group was one of those which received decided impetus from the political rumours current at the end of last week. Vickers shot up from 6s. 3d. to 7s. Babcock and Wilcox from 41s. rose to 45s. Other gains were in proportion. The North came in as a fairly heavy buyer of its own favourites, and, as was the case in the other markets, the amount of supply available to meet the demand was small.

Dollar Stocks

Brazilians are mainly better on account of the more cheerful aspect which has developed in connection with that country's finances. This has been reflected in rises amongst Brazilian utilities. Brazilian Tractions are 1¼ better at 16. The preference shares are quoted at the extremely wide margin of 78 to 98 xd. Shares changed hands about a week ago at 80. Buenos Aires Lacroze Tramways 5 per cent. external debentures, which fell heavily a few weeks ago, have recovered to 70½. In the Mexican group, the prevailing disposition is dull, Mexican Light and Power 7 per cent. preference shares receding to 64¼, and the company's second preference going back to 2 5/16. Of the Canadian-American utilities, Shawinigan at 40 are ex dividend, having recovered the deduction. Montreal Light and Power, at 44¼, show a 1½ point rise. Power Corporation of Canada remain at 43 middle.

Amongst the miscellaneous movements, a fall of 5 in Prussian Electric bonds has reduced the price to 70. Tokyo Electric sixes eased off to 90½. On the other hand, Whitehall Electric first debenture, at 105. is slightly higher. British Electric Traction deferred, at 1025, has recovered its 50 points loss of a week ago, the report being regarded as satisfactory. Atlas shares, after being down to 15s., rallied to 16s. 3d. Electrical Distribution of Yorkshire new shares are firm at 5s. 6d. premium, and the new Northamptons at 37s. Para Electric Railway preference have weakened to half-a-crown.

Share List of Electrical Companies

Home Electricity Companies

	Nom.	Approx. Dividend 1929.	1930.	Price June 16 1931.	Rise or fall.	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	58/9	—	5 2 2
Brompton Ordinary	1	8½	8½	28/6	—	4 18 3
Central Electricity 4½% Deb.	Stock	—	4½	97½	—	4 12 6
Charing Cross Ordinary	1	8½	8½	30/-	+6d.	4 13 4
Chelsea	1	8¾	8¾	27/6	—	5 1 10
City of London	1	10	10	36/3	—	5 10 3
Clyde Valley	1	8	8	32/-	—	5 0 0
County of London	1	7	10	45/-	+1/8	4 9 0
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	42/6xd	+1/-	5 3 9
Kensington Ordinary	1	8	8	30/-	—	4 13 4
Lancs. Light and Power	1	7	6½	21/-xd	—	6 10 0
London & Home Counties 4½% Deb.	Stock	—	—	98	—	4 12 0
London Electric	1	8½	9	34/-	—	5 5 11
Metropolitan	1	9	10	39/3	—	5 1 11
Midland Counties	1	6½	7	26/3	—	5 6 8
Mid. Elec. Power	1	15	8	27/-	—	5 18 6
Newcastle-on-Tyne Ordinary	1	6	6	21/3	—	5 13 0
do. 7% Pref.	1	7	7	27/-	—	5 3 8
Notting Hill 6% Pref.	10	6	6	11¼	—	5 6 8
North Met. Elec. 6% Pref.	1	6	6	24/-	—	5 0 0
St. James' and Pall Mall	1	8	8	29/-	—	4 16 7
Scottish Power	1	8	8	27/6	—	5 16 5
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	27/6xd	—	5 1 10
Westminster Ordinary	1	8½	8½	29/-	+6d.	4 16 7
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	24/6	—	6 2 5
Yorkshire Elec.	1	8	8	30/-	—	5 6 8

Home Rails

Central London Ord. Assented	Stock	4	4	76	—	5 5 3
Metropolitan	,,	4	3½	48½	+2	7 4 4
do. District	,,	5	5	64½	—	7 15 0
Underground Electric	£1	8	8	21/-	+1/-	7 12 5

Telegraphs and Telephones

Anglo-Am. Tel. Pref.	Stock	6	6	104½	+½	5 14 10
do. Def.	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	12½	12½	32/6	—	7 18 10
Cables & Wireless 5½% Pref.	Stock	5½	5½	54½	+3	10 1 10
do. A 7½% Ord.	,,	Nil	—	14	+2	... ...
do. B Ord.	,,	Nil	—	8	+1	... ...
Globe Tel. and T. Ord.	10	10	—	7½	—	... ...
do. do. Pref.	10	6	6	8½	—	7 1 2
Great Northern Tel.	10	20	20	25½	—	7 17 0
Marconi-Marine	1	15	15	32/6	+6d.	9 4 8
Oriental Telephone Ord.	1	12	12	24	—	*5 6 8

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref.	5	5½	—	12/6	—	... ...
do. do. 2nd Pref.	5	6	—	7/6	—	... ...
do. do. 5% Deb.	Stock	5	5	21½	—2	23 5 0
British Electric Traction Def. Ord.	,,	5	5	1025	+50	... ...
do. do. Pref. Ord.	,,	8	8	122½	—	6 10 8
Brazil Traction	100	8	—	16	+1¼	... ...
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	97½	—	5 2 7
London & Sub. Trac. 5% Pref.	1	Nil	Nil	11/6	—	... ...
London United Tram Deb.	Stock	4	4	62½	—	6 8 0
Mexico Trams, 5% Bonds	—	5	5	42½	—	11 15 4
Mexican Light Common	100	Nil	Nil	37½	—	... ...
do. 7% Pref.	100	7	7	64½	—2	10 17 0
do. 1st Bonds	—	5	5	76	—1	6 11 7
Victoria Falls Ord.	1	15	15	57/6	—	5 4 2
Yorkshire (West Riding)		Nil	Nil	5/6	—	... ...

Manufacturing Companies

Assoc. Elec. Ord.	1	6	6	18/6	—	6 9 9
do. Pref.	1	8	8	27/6	—	5 16 0
Babcock & Wilcox	1	15	14	45/-	+1/8	*6 4 5
British Aluminium Ord.	1	10	10	25/-	—	8 0 0
British Insulated Ord.	1	15	15	2⅝	—	5 14 2
Brush Ord.	Stock	10	5	60xd	—	8 5 0
Callenders	1	15	15	2⅞	—	6 3 0
do. 6½% Pref.	1	6½	6½	25/-	—	5 4 0
Crompton Parkinson Ord.	5/-	30	30	4	—	8 11 5
do. 8% Pref.	1	8	8	28/-	—	5 14 5
Edison-Swan 1st Pref.	1	7½	7½	23/9	—	6 6 4
do. 5% Deb.	Stock	5	5	94½	—	5 5 10
Electric Construction	1	5	Nil	11/3	—	... ...
Enfield Cable Ord.	1	25	25	3¾	—	6 14 1
English Electric	1	Nil	Nil	5/-	—	... ...
do. do. Pref.	1	Nil	Nil	5/-	—	... ...
Ferranti Pref.	1	7	7	21/-	—	6 10 4
G.E.C. Pref.	1	6½	6½	26/-xd	+6d.	5 0 0
do. Ord.	1	14	...	36/6	+6d.	7 13 6
Henley	1	30	...	4¾	+⅛	6 2 0
do. 4½% Pref.	5	4½	4½	4¾	—	5 2 10
India-Rubber	1	Nil	Nil	4/6	—	... ...
Johnson & Phillips	1	10	10	37/6	—	7 5 6
Siemens Ord.	1	7½	7½	22/-xd	—	6 16 4
Telegraph Construction	12	10	7½	18	—	6 18 3

*Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1929

34,566. "Rotating electric rectifiers." A. Gozzano, and Soc. Anon. Accumulatori Dr. Scaini. November 13th, 1928. (349,005.)

1930

1,430. "Electric ship propulsion." English Electric Co., Ltd., J. C. Wilson, and H. S. Carnegie. January 15th, 1930. (349,012.)

1,446. "Submarine electric signalling cables." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). January 15th, 1930. (349,105.)

2,117. "Electric differential circuits." Kolster Brandes, Ltd. (Kolster Radio Corporation). January 21st, 1930. (349,109.)

3,910. "Electric glow-discharge lamps." Westinghouse Electric & Manufacturing Co. February 5th, 1929. (349,013.)

4,496. "Apparatus for the recording and reproduction of sound." Electrical Research Products, Inc., H. J. Neill, and B. G. Calver. February 10th, 1930. (349,111.)

4,696. "Traffic-control signalling devices." C. B. Walker. February 12th, 1930. (349,113.)

4,805. "Electrical sound reproducing apparatus." Dr. H. Konemann. February 28th, 1929. (349,019.)

5,037. "Electrical apparatus for instructing a subsidiary station from a main station." Siemens & Halske Akt.-Ges. February 20th, 1929. (349,073.)

5,160. "Electric switching or interrupting mechanisms for use in signal lamps or beacons." W. W. Triggs (National Carbon Co.). February 15th, 1930. (349,120.)

5,286. "Telegraph receiving or repeating circuits." Western Union Telegraph Co. March 5th, 1929. (349,074.)

5,404. "Commutating arrangements for continuous-current motors." Akt.-Ges. Brown Boveri & Cie. March 1st, 1929. (349,024.)

5,431. "Telegraphic installations." Siemens & Halske Akt.-Ges. February 19th, 1929. (Addition to 306,406.) (349,124.)

5,451. "Synchronous reproduction from picture and sound records." British Thomson-Houston Co., Ltd., and R. D. Given. February 18th, 1930. (349,025.)

5,537. "High frequency composite transmission systems and cables or conductors therefor." Standard Telephones & Cables, Ltd. March 30th, 1929. (349,029.)

5,607. "High-frequency circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., and F. C. Lunnon. February 19th, 1930. (349,035.)

5,723. "Traffic control signals." Automatic Telephone Manufacturing Co., Ltd., S. R. Smith, T. P. Preist, and R. N. Saxby. February 20th, 1930. (349,081.)

5,746. "Wave-responsive apparatus." J. Robinson. February 20th, 1930. (349,083.)

5,936. "Electric light fittings with bowl shades or reflectors." H. C. Pride. February 22nd, 1930. (349,129.)

6,730. "Heating grids suitable for electric resistance furnaces." W. S. Smith, and C. V. H. Garnett. February 28th, 1930. (349,138.)

6,734. "Radio-transmitting systems." Marconi's Wireless Telegraph Co., Ltd. April 2nd, 1929. (349,140.)

6,872. "Electric supply systems." H. Foale. March 1st, 1930. (349,148.)

7,366. "Manufacture of coloured electric light bulbs." Imperial Chemical Industries, Ltd., and E. A. Bevan. March 6th, 1930. (349,160.)

7,410. "Means for radio direction-finding." Submarine Signal Co. March 7th, 1929. (349,162.)

7,489. "Electromagnetic double-acting balanced valve." J. L. Musgrave, and R. Crittall & Co., Ltd. March 7th, 1930. (349,166.)

7,497. "Oil switches of high interrupting capacity." Elin Akt.-Ges. für Elektrische Industrie. March 9th, 1929. (349,166.)

7,539. "Remote-control systems for electric motors." Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.). March 7th, 1930. (349,169.)

8,027. "Electromagnetic step-by-step switches." Coventry Automatic Telephones, Ltd., and C. C. Puckette. March 12th, 1930. (349,180.)

8,853. "Electric protective systems." British Thomson-Houston Co., Ltd. March 19th, 1929. (349,199.)

10,799. "Mine signalling systems." J. M. Lyden. April 4th, 1930. (349,221.)

11,123. "Pressure-protecting tubes for deep-sea electric signalling cables." Felten & Guilleaume Carlswerk Akt.-Ges. June 1st, 1929. (349,226.)

11,153. "Electric cable junction boxes." Siemens Bros. and Co. ,Ltd., and L. Hindley. April 8th, 1930. (349,227.)

11,286. "Electric motor controllers." Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.). April 9th, 1930. (349,231.)

11,813. "Apparatus for detecting and amplifying relatively weak electric currents." Radiotechnique. June 14th, 1929. (349,237.)

11,878. "Insulators for electric conductors." Electrical Improvements, Ltd., and P. J. Ryle. April 15th, 1930. (349,240.)

11,947. "Cements for capping electric lamps and the like." General Electric Co., Ltd. April 24th, 1929. (349,244.)

12,503. "Automatic self-insulating plug-and-spade terminal for wireless and electrical purposes." P. Marks. April 23rd, 1930. (349,250.)

12,599. "Picture telegraph, television and like receivers." Marconi's Wireless Telegraph Co., Ltd. May 3rd, 1929. (349,253.)

12,794. "Call-finding arrangements in automatic telephone systems." Siemens Bros. & Co., Ltd., and R. G. Dixon. April 25th, 1930. (349,256.)

13,163. "Telephone instruments." Siemens Bros. & Co., Ltd., and W. E. Goodwin. April 29th, 1930. (349,259.)

13,317. "Electric discharge lamps." General Electric Co., Ltd., J. W. Ryde, and H. G. Jenkins. April 30th, 1930. (349,261.)

13,484. "Automatic re-closing circuit-breaker systems." British Thomson-Houston Co., Ltd. May 1st, 1929. (349,264.)

13,561. "Electrical machines." Allgemeine Elektricitäts Ges. May 2nd, 1929. (349,265.)

14,191. "Electricity meters." Aron Electricity Meter, Ltd., E. W. Hill, A. White, and E. J. Riordan. May 8th, 1930. (349,275.)

14,833. "Electric stop motion for knitting machines." A. Crawford. April 1st, 1930. (349,286.)

15,121. "Paper-insulated high-pressure electric cables." Siemens-Schuckertwerke Akt.-Ges. May 28th, 1929. (349,289.)

15,468. "Electric discharge devices for producing ultra-violet rays." F. Reynolds. May 20th, 1930. (349,294.)

15,637. "Safety devices for electric lifts." A. Iaquinto. May 21st, 1930. (349,295.)

15,865. "Joint boxes for electric cables." Bestwood Coal and Iron Co., Ltd., and H. Drury. May 23rd, 1930. (349,300.)

17,287. "Electric heaters." British Thomson-Houston Co., Ltd. June 6th, 1929. (349,324.)

19,377. "Electric battery lamps." Elektrotechnische Fabrik Schmidt & Co., Ges. March 7th, 1930. (349,347.)

21,770. "Device for stopping rotating bodies more especially the rotors of electricity meters." Landis & Gyr Soc. Anon. July 23rd, 1929. (349,362.)

23,245. "Devices for transmitting and conducting pneumatic and electrical energy." Aktiebolaget Separator. August 10th, 1929. (349,379.)

24,814. "Fuse mechanisms." Associated Electrical Industries, Ltd. August 20th, 1929. (349,386.)

26,774. "High-potential dynamo-electric machines." Siemens-Schuckertwerke Akt.-Ges. September 9th, 1929. (349,395.)

27,031. "Electric contact pieces." F. Krupp Akt.-Ges. September 25th, 1929. (349,400.)

27,464. "Structural combinations of capacities and inductance coils particularly for wireless signalling." A. Nissen. September 16th, 1929. (349,403.)

28,134. "Magneto-electric ignition apparatus." R. Bosch Akt.-Ges. October 7th, 1929. (349,405.)

30,705. "Mercury-vapour rectifiers." Akt.-Ges. Brown Boveri et Cie. December 5th, 1929. (349,411.)

31,915. "Mercury-vapour rectifiers." Akt.-Ges. Brown Boveri et Cie. April 19th, 1930. (349,413.)

32,218. "Hoop-iron armouring for electric cables." Naamlooze Vennootschap Handelmaatschappij Cablon (Cablon Corporation). October 26th, 1929. (349,415.)

33,032. "Systems of electrical distribution." British Thomson-Houston Co., Ltd. November 1st, 1929. (349,418.)

34,641. "Sparking-plug tester." B. W. Oldham. November 18th, 1930. (349,419.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 10th:—

Calsun Bronze (lettering and design). No. 520,870. Class 5. Bronze wire, &c.—Anaconda Wire & Cable Co., New York. (British representatives: Mewburn, Ellis & Co., 70-72, Chancery Lane, W.C.2.)

Radioclar. No. 521,626. Class 6. Machinery of all kinds. No. 521,627. Lighting, heating, cooking, cooling, drying and ventilating plant.—Siemens-Schuckertwerke Ges., Berlin. (British representatives: Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, W.C.2.)

S.E.S. (lettering and design). No. 517,921; and Gallulose No. 517,922. Class 8. Fitted electrical switchboards and electrical combined switch-fuse boards.—Simplex Conduits, Ltd., Garrison Lane, Birmingham.

Telenberg. No. 522,521. Class 8. Instruments and apparatus for radio signalling, sound reproducers and thermionic amplifiers, electric gramophones in combination with radio-receiving sets, and parts thereof, &c.—M. Lichtenberg, 4, Great Queen Street, W.C.2.

Slektun. No. 522,592. All goods in Class 8.—Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas Street, S.W.1.

Lister. No. 513,228. Class 18. Electric lighting plants.—R. A. Lister & Co., Ltd., Dursley, Glos.

Travelling Printing Press

At the recent race meeting at Epsom the *Evening Standard* brought into use a novel travelling printing press. The outfit, which is mounted on a Guy six-cylinder motor van, is capable of printing stop-press news at the rate of 8,500 copies per hour. It is to be used at race meetings and important public events throughout the country for the purpose of printing on the latest available editions of the newspapers still later news received by telephone from the editorial office in London. At the forward end of the van, on the offside, is a detachable composing table, whilst at the rear is a table for stacking printed newspapers. The printing machine is located in the centre and is electrically driven, this part of the equipment having been supplied by the Electrical Auto Services Co. A 1¼-kW, 220-V, dynamo mounted under the driving seat is driven by Whittle belts off the side of the chassis gear box. An armoured cable transmits the electric power to a motor fixed to the frame of the press. A compact switchboard is mounted in a central panel behind the driver's seat, a further safeguard being an electrical cut-out on the dynamo itself. The ordinary electrical equipment of the vehicle is augmented by an extra 12-volt 75-ampere-hour battery. With the printing press, dynamo, and other equipment, the vehicle weighs about 4 tons 3 cwt. and, in addition, it has to carry five men and a load of up to 10 cwt. of newspapers.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Birkenhead.—Extensions, hospital nurses' home; Woolfall and Eccles, architects, 60, Castle Street, Liverpool.

Birmingham.—Houses (400), Messuage Farm and Mill Pool Hill; city engineer. Shop premises, Suffolk Street and John Bright Street, for Corporation; H. H. Humphries, city engineer, Council House.

Blackpool.—Houses (200), Highfield Road; borough engineer. Houses (24), Toronto Avenue, for T. Brierley. Church, Stonycroft Avenue, for St. Mary's Church Council.

Blyth.—Three new secondary schools, and alterations to New Delavel Senior School, for the E.C.; L. Leeper, borough engineer.

Bournemouth.—School, Ensbury Park (£11,140) for the borough E.C.; Hawkins Bros., builders.

Bradford.—Houses (456), Horton Bank Top; R. J. Patchett, Ltd.

Bristol.—Houses (250), Southmead estate (£92,500), and clearance scheme, Hope Square area; city engineer.

Burton-on-Trent.—Houses (36), Woods Lane; borough engineer.

Carlisle.—Central transport depôt, Old Greystone site (£14,500); city engineer. Premises, Warwick Road; State Management Trustees.

Cheshire.—Schools, Poynton; F. A. Browne, county architect, The Castle, Chester.

Cheshunt (HERTS.).—Houses (70), Cromwell Avenue, for the U.D.C.; surveyor.

Chesterfield.—Houses (60), Newbridge Lane and Dickinson Road, and rehousing scheme, Whitebank Yard; borough engineer. Sewage works extensions (£33,000); F. Haslam, Ltd., Doncaster.

Chichester.—Hall of residence, Bishop Otter College; Gutteridge and Gutteridge, architects, 9, Portland Street, Southampton.

Cleveleys (NR. BLACKPOOL).—Concert hall, &c., on the Promenade for T. Gray; R. H. Cunliffe, architect, Victoria Road.

Colchester (ESSEX).—Houses (64) for the T.C.; city surveyor.

Consett.—Housing scheme; surveyor to the U.D.C.

Derby.—Houses (600) and shops (16), Normanton, for the T.C.; borough surveyor.

Droitwich.—C.O.E. Central School; vicar of Droitwich.

Epping.—Houses (38) for the U.D.C.; surveyor.

Essex.—Schools, Dagenham (£22,909), Romford and South Benfleet (£8,281), for the county E.C.; director of education, Chelmsford. School, Marsh Green, Dagenham (£40,021); V. G. Selwood & Co., builders, Chelmsford.

Farnham.—Premises for Hugh-Jones & Partners, Runfold; G. H. Perkins.

Felling-on-Tyne.—Extensions and alterations to High Felling Council School (£11,340); council surveyor.

Feltham.—Showrooms, workshop, &c.; Feltham Motors, Ltd. Houses (20), Manor estate; W. J. Drinkwater & Sons.

Fife.—Houses (1,040) during the next three years for the C.C.; county surveyor, Cupar.

Glasgow.—Extensions, at Hawkhead Mental Hospital and staff accommodation at Woodilee and Gartloch hospitals; city engineer and medical officer.

Hampton.—Alterations, High Street, for Bentalls, Ltd.; T. A. Griffin.

Harrogate.—Conversion of premises into fire station and electricity showrooms for the T.C.; borough surveyor.

Hastings.—Alterations to Eversfield Chest Hospital, West Hill Road; J. R. Scott. Alterations, London Road, Ore; Lloyds Bank, Ltd. Houses (21), Benconsfield Road; F. Jeffery & Bowcock, architects.

Hatfield (HERTS.).—Houses (40) and flats (12), Hatfield, for the R.D.C.; J. R. Howarth, surveyor.

Hawick.—Houses (48); burgh surveyor.

Hornchurch (ESSEX.).—Cinema theatre, High Street, with lighting and heating work, for D. J. James, Capitol Cinema, Upminster.

Huntly (ABERDEENSHIRE).—Cinema, Gordon Street; D. and J. R. McMillan, architects, 105, Crown Street, Aberdeen.

Inverness.—Houses (38) for the C.C.; county surveyor, Inverness.

Leicestershire.—Senior school, Market Harborough, for the county E.C.

Irish Free State.—(CAVAN).—Extension to Drumkeen House, Loreto College; T. T. Cullen, architect, 25, Suffolk Street, Dublin. (DUNMANWAY, CO. CORK).—Electric lighting installation at new hospital for West Cork Board of Public Assistance; J. J. Crowley, architect, County Home, Clonakilty. (WEXFORD).—Alterations to Municipal Technical Institute for the Vocational E.C., &c.; C. J. Morris, architect.

Irlam (LANCS.).—Public offices (£10,000) for the U.D.C.; surveyor.

Kidderminster.—Public baths (£20,000) for the T.C.; borough surveyor. C.O.E. Central School; vicar of Kidderminster.

Kirkcaldy.—Houses (300) for Public Health Committee, Fife C.C.

Lanarkshire.—R.C. school at Carfin; master of works, C.C., Hamilton.

Lancashire.—Houses (50), Rainhill Mental Hospital, for the C.C.; county architect, Preston.

Liverpool.—Houses (498) and flats, Ackers Hall, Dovecot estate; director of housing, Municipal Buildings, Dale Street. School, Dovecot housing estate; land steward.

London.—(EAST HAM).—Girls' secondary school, Plashett Grove (£40,100), for the borough E.C.; H. C. Horswill, builder, Upton Park. (ILFORD).—Houses (68), Fairfield Road; Messrs. Kemsleys. Houses (20), Fairmead Gardens; H. A. Smith. Houses (22), Hastings Avenue; H. W. Christopher. Factory extensions, Grove Road; F. H. Toms. St. George's Church, Woodford Avenue; C. A. Nicholson. Institute, U.M. Church, Seven Kings Road; G. Baines & Son. Store, Woodlands Road; Fullers, Ltd. (LEWISHAM).—Houses (38), Chudleigh Road; J. W. Heath and Sons.

Manchester.—Alterations and additions to premises of Charles Ashley & Co., Ltd.; E. Dawson, architect, 49, Deansgate, Manchester. R.C. school, Victoria Avenue; rector of St. Clare's, Blackley.

Matlock.—Re-instatement of Causeway Lane Cinema House, electrically equipped; H. Hodgkinson, manager.

Middlesbrough (DURHAM).—Houses (54), Whinney Banks estate; county surveyor.

Morden (SURREY).—St. Peter's Church (£16,000); Sir Charles Nicholson, architect. District church (£8,000); Geddes Hyslop, architect.

Newbiggin-by-the-Sea.—Housing scheme; Mr. Kailofer, surveyor.

Newcastle-on-Tyne.—Houses (60) at Jesmond Dene; Cussins, Ltd., builders, St. Mary's Place. Extensions and improvements to bakery of Carricks & Co., and Congregational church at Fenham; Marshall & Tweedy, architects, Mervyn House, Pilgrim Street. Confectionery works at Heaton for Messrs. Watson; R. Burke, architect, 12, Grey Street. Extensions and improvements to Rinaldo's Restaurant, Grainger Street; J. Walton Taylor, architect, St. John Street. Schools, Ferguson's Lane, Westgate Road, and extensions to Wingrove and Cruddas Park schools for the E.C.; Mr. Walling, director of education.

Newport (MON.).—Secondary school (1,000 places), St. Julian area for the E.C.; C. F. Ward, borough architect, Cherry Orchard, Christchurch Road.

Oxford.—Buildings, New Road and Bulwarks Lane (£3,500); Davey Bros. Laundry extensions, Sunnymeade; French Laundry, Ltd.

Portsmouth.—Houses (72), Hawthorne Crescent, Cosham; G. & W. Mitchell. Showrooms and offices, London Road; Ward Bros.

Potton (BEDS.).—Church, Wesleyan trustees; secretary.

Prestwich.—Extensions to sewage disposal works; H. T. Ainsworth, engineer and surveyor to U.D.C., Town Hall.

Redcar (YORKS.).—Christian science church, Station Road; J. E. Dover, contractor, Croft Road, Blyth.

Retford.—Houses (62) for the T.C.; borough surveyor.

Ripley (DERBYSHIRE).—Houses (27) for the U.D.C.; surveyor.

Rochdale.—Senior school, Balderstone; director of education.

St. Andrews.—Houses (70); Public Health Committee, Fife C.C.

Seaton Delaval (NORTHUMBERLAND).—Houses (350); U.D.C. tect, Portland Street.

Sefton.—Houses, Fleetwood Lane site; R. Rosbotham, surveyor to the R.D.C., Derby Street, Ormskirk.

Shoreham (SUSSEX).—Houses (80) for the U.D.C.; surveyor.

Shropshire.—School, Wrockwardine Wood, for the county E.C.; A. G. Chant, county architect, 5, Belmont, Shrewsbury.

Skegby (NOTTS.).—Houses (50) for the R.D.C.; L. Dodsley, architect, Portland Chambers, Sutton-in-Ashfield.

Southampton.—Wesleyan Hall (£25,000); H. Collins, architect, Portland Street.

South Shields.—Houses for aged people, clearance scheme, Mitre Street area, and alterations to Town Hall; borough engineer. Airport; Corporation and Tyne Commissioners. Shops and houses for J. Brown; F. W. Newby, architect, 37, King Street.

Spilsby (LINCS.).—Houses (24) for the R.D.C.; surveyor.

Staffordshire.—Schools, Rugeley and Penkridge, for the county E.C.; director of education, Stafford.

Stirling.—Extensions to the Station Hotel; J. Miller, architect, 15, Blythswood Square, Glasgow.

Stocksbridge.—Housing scheme; E. Johnson, U.D.C. surveyor.

Thornton Cleveleys.—Church, Rossall Road, for the Congregational authorities; Wynne-Thomas & Button, architects, 25, Wood Street, Bolton.

Totnes (DEVON).—Houses (92) for the T.C.; J. White, borough surveyor.

Ulverston.—Extension of High Carley Sanatorium; county architect, 16, Ribblesdale Place, Preston.

Wakefield.—Houses (20), Lupset estate (£9,000), and extensions, Almshouse Lane baths (£20,000); city architect.

Walsall.—Houses (182), Field Road estate (£51,842); Sabin and Young, Ltd., Doncaster. Enlargement, Goscote Sanatorium (£17,500), and extensions to isolation hospital (£14,500); borough engineer.

Watford.—Houses (21), North Western Avenue; Kempster and Williams. Houses (47), Purbrook Avenue; F. W. Brockett. Rehousing scheme, Rookery site; borough engineer. Hall, Clarendon Road; Y.W.C.A. Laundry buildings, Hagden Lane; Watford Model Laundry. Shopping centre, Cassiobury Drive; Cassiobury estates, Ltd. Store, Whippendell Road; Messrs. Millers.

West Bromwich.—Telephone exchange, Stone Cross, for H.M. Office of Works, 43-46, New Street, Birmingham, and King Charles Street, London, S.W.

West Dean (GLOS.).—Houses (100 this year and 200 in the next two years) for the R.D.C.; surveyor, Coleford.

West Hartlepool.—Houses (100) for the T.C.

West Wickham (KENT).—Cinema theatre, and assembly hall, High Street and Grosvenor Road; A. J. Butcher, architect, 2, Premier Parade, Edgware.

Wing (BEDS.).—Houses (30) for the R.D.C.; surveyor.